DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

Permit Application Analysis
A0000611

September 11, 2015

NAME OF FIRM:	Thunder Basin Coal Company, LLC
NAME OF FACILITY:	Black Thunder Mine
FACILITY LOCATION:	Twelve (12) miles southeast of Wright Campbell County, Wyoming
TYPE OF OPERATION:	Surface Coal Mine
RESPONSIBLE OFFICIAL:	Mr. Kenneth Cochran President and General Manager
MAILING ADDRESS:	P.O. Box 406 Wright, WY 82732
TELEPHONE NUMBER:	(307) 464-2113
REVIEWERS:	Andrew Keyfauver, NSR Permit Engineer Nathan Henschel, NSR Air Quality Modeler

1.0 PURPOSE OF APPLICATION:

Thunder Basin Coal Company, LLC submitted an application to modify operations at the Black Thunder Mine. This application proposes to modify the coal removal progression and to modify the Lands Necessary to Conduct Mining (LNCM) boundary. In addition, a new truck dump and associated coal preparation facilities (West Hilight) will be constructed on the west side of the mine which will connect into the existing west loadout facilities at the mine.

2.0 PERMIT HISTORY

2.1 Black Thunder

Air Quality Permit MD-14786 was issued on December 18, 2013, to add an additional 136 hp Cummins emergency fire pump. This permit also updated emissions for the two (2) hot water generators (boilers #1 and #2), and updated hours of use and horsepower information for the five (5) emergency generator engines and the three (3) emergency fire pumps. This permit superseded air quality permit MD-10900.

Air Quality Permit MD-15396 was issued on December 17, 2013, to modify the Lands Necessary to Conduct Mining (LNCM) boundary to include an additional 162.3 acres on the eastern boundary of the mine in Sections 25 and 26 of Township 43N, Range 70W, and allows additional lands for scoria mining.

Air Quality Permit MD-10986 was issued March 16, 2011, to combine the Black Thunder Mine and Jacobs Ranch Mine into one entity (Black Thunder Mine) with a maximum annual coal production rate of 190 million tons per year (MMtpy), and modified the coal progression sequence. This permit superseded all previous Chapter 6, Section 2 permits and waivers for the Black Thunder and Jacobs Ranch Mine, except for air quality permit MD-10900.

3.0 PROCESS DESCRIPTION

3.1 Mine Plan

The exiting Black Thunder Mine is an existing surface mine that produces sub-bituminous coal and is located approximately twelve (12) miles southeast of Wright, Wyoming. Overburden is removed by cast blasting, dozer pushes and dragline along with the conventional truck and shovel method. Mined coal is hauled to truck dumps where the coal is crushed and transferred via covered conveyors to storage silos and loadout facilities. Figure 3-1 shows the proposed pit progression along with the Black Thunder Mine LNCM Boundary. This figure is contained in the application as Map 2 – Black Thunder Mine Coal Progression and Monitoring Station Locations. Figure 3-2 shows Black Thunder Mine's pit progression along with the neighboring mines in the South Group of mines. This figure is contained in the application as Map 5 – Black Thunder Mine Modeling Area Overview.

3.2 Coal Preparation Facilities

The existing coal preparation facilities at the Black Thunder Mine are designated as the Primary, Near-Pit, 5-West Near-Pit Crushing and Conveying (NPCC) system, 6-North NPCC system, and Circuits 3 and 4. The Primary truck dump/crusher is located near the storage and loadout facilities for coal mined in pits closer to the facilities. The Near-Pit consists of two side-by-side truck dumps with crushers that feed the overland conveyor which transports coal to the main storage and loadout facilities. The 5-West NPCC system consist of one truck dump, crusher, and conveyor and is located southwest of the Black Thunder rail loop at the mine. The Primary, Near-Pit, and 5-West NPCC deliver coal to the main rail loop loadout system. The 6-North NPCC system consists of one truck dump hopper with a stilling shed, a 7,000 ton per hour two-stage crusher, and an 11,000 foot long, 72 inch wide overland conveyor, which feeds is own loadout system known as the West Black Thunder Loadout. Circuit 3 is a parallel truck dump-crusher-conveyor system which feeds the East Black Thunder Loadout. Circuit 4 consists of a dual truck dump, crusher, and overland conveyor system which feeds the East Black Thunder Loadout. Existing truck dumps at the Black Thunder Mine are controlled with stilling sheds, and conveyor transfer points are controlled with atomizer/fogger systems.

The proposed truck dump and coal preparation facilities (West Hilight) are proposed to be controlled with a stilling shed with transfer points controlled by atomizer/fogger systems

Figures 3-3 and 3-4 provide schematics of the existing and proposed coal processing and conveying equipment at the Black Thunder Mine.

Figure 3-1: Proposed Black Thunder Mine Pit Progression and LNCM Boundary

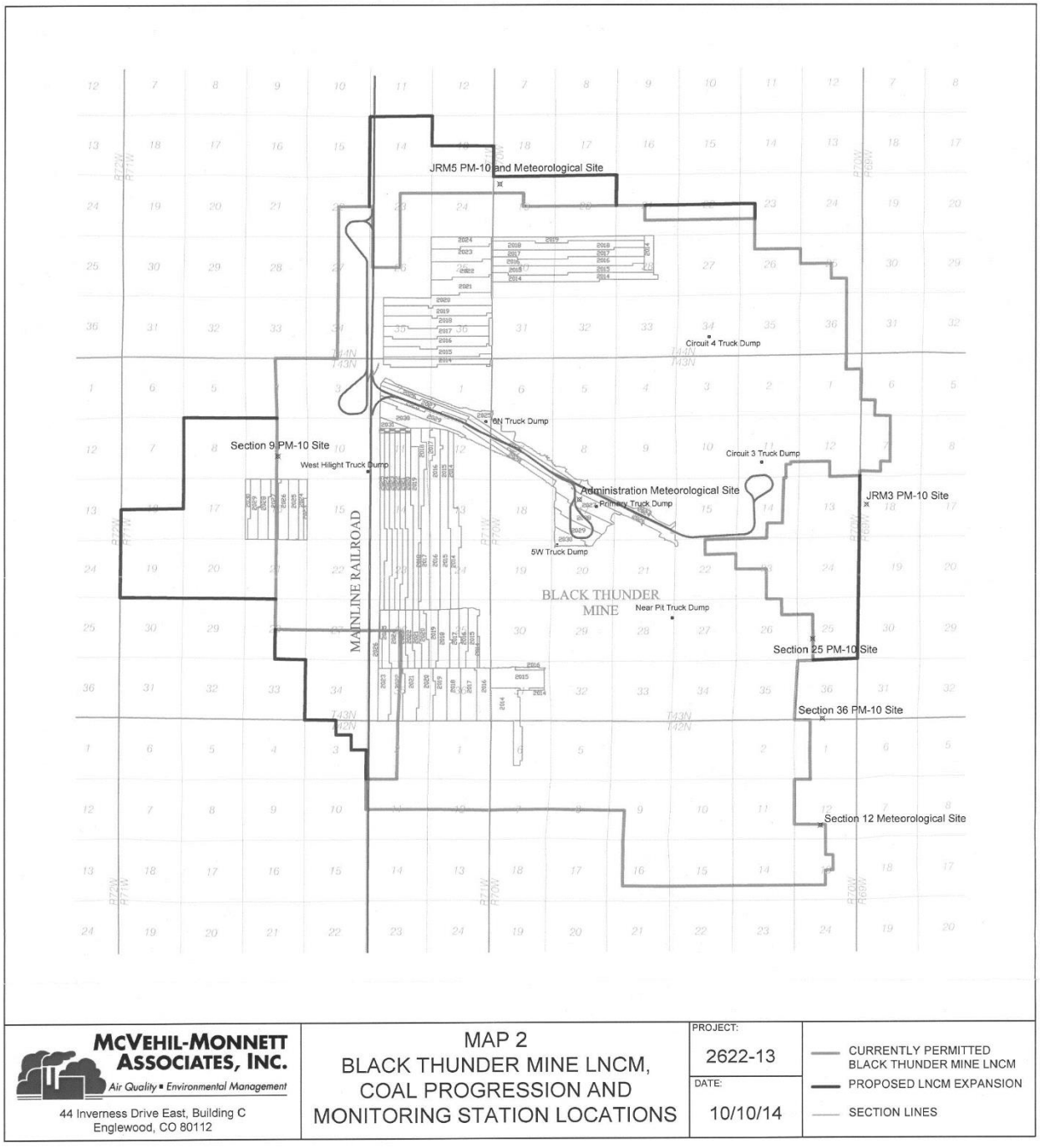


Figure 3-2: South Group Pit Progression Overview

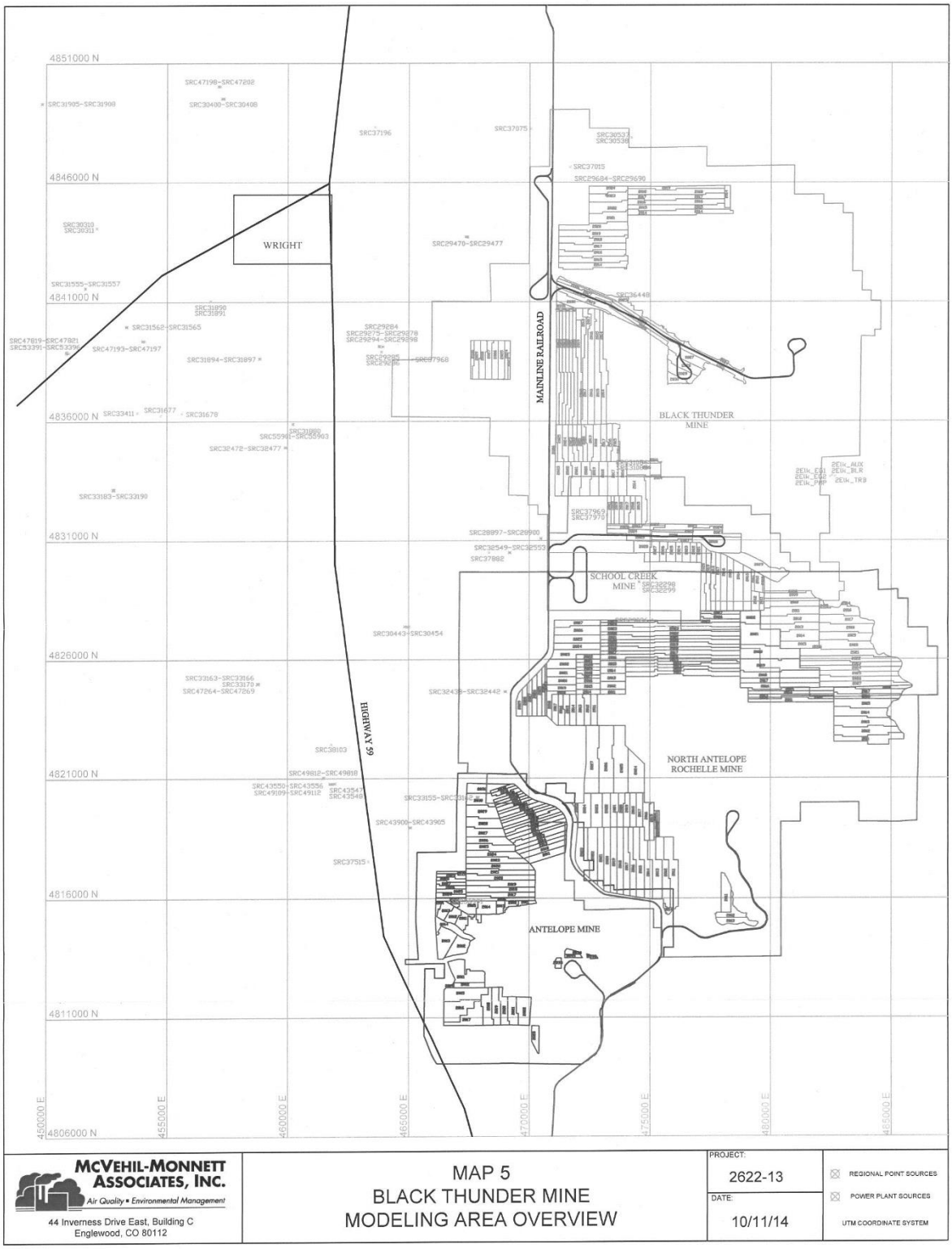


Figure 3-3 – Existing and Proposed Black Thunder Coal Preparation Facilities

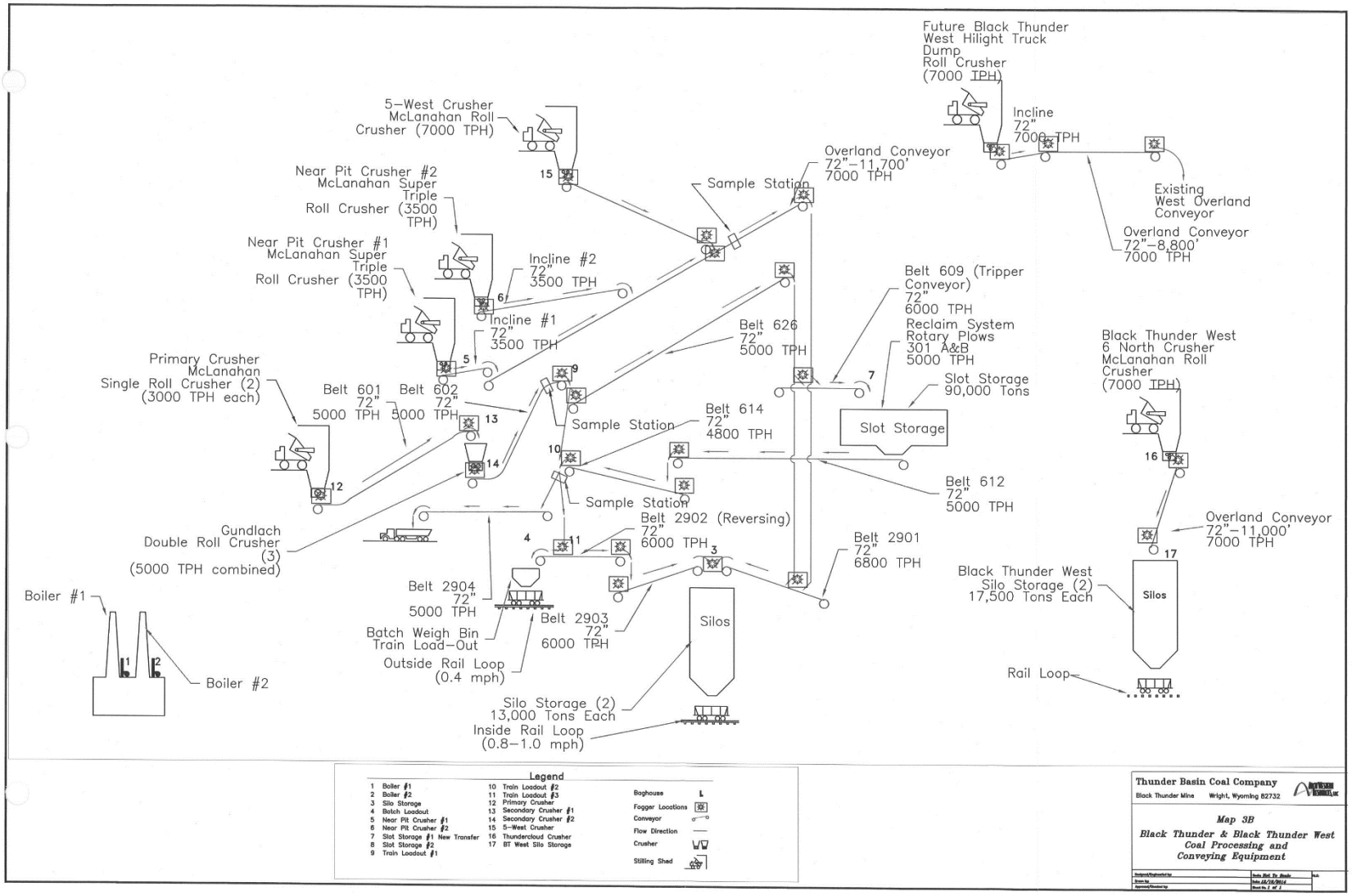
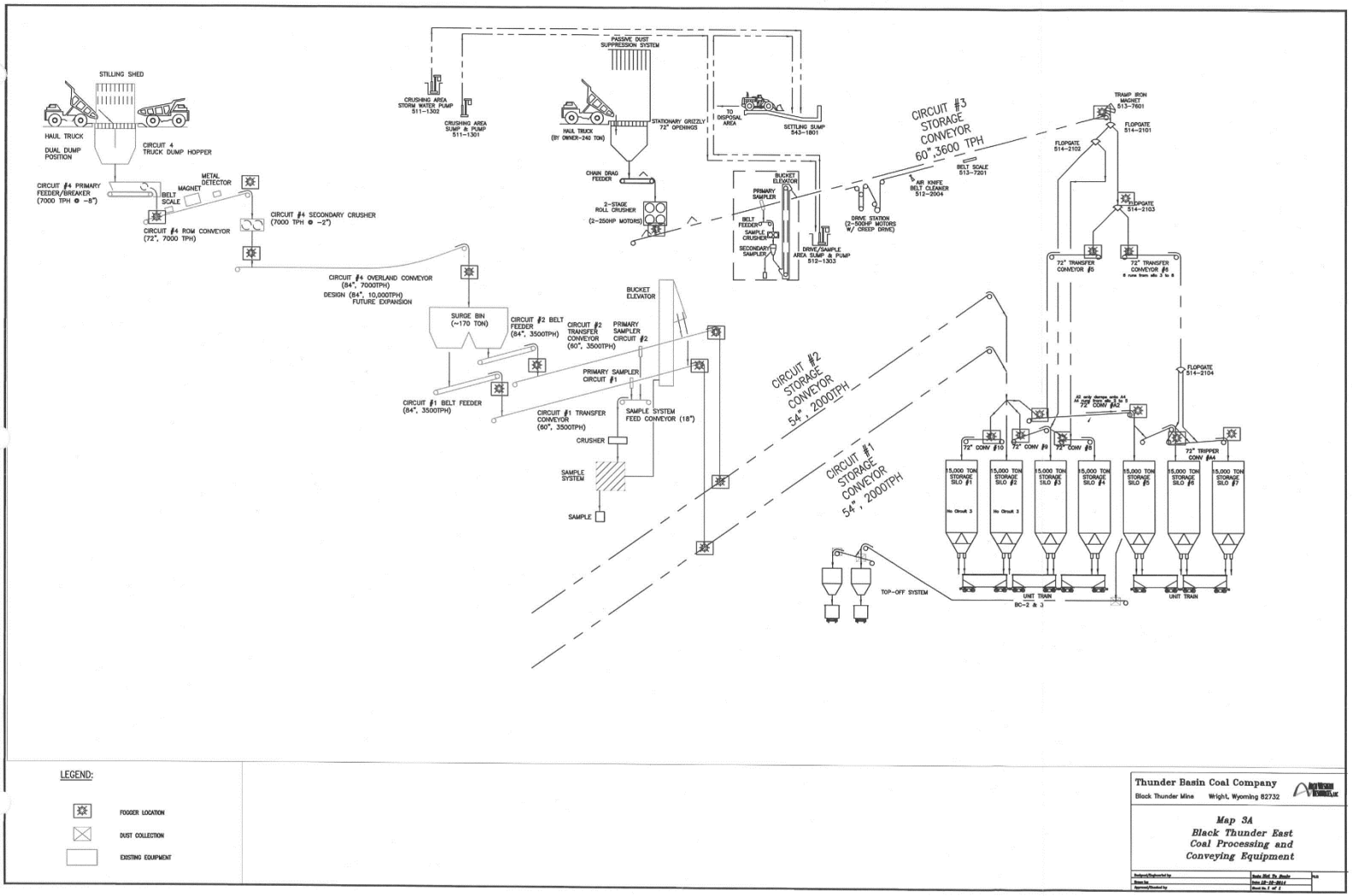


Figure 3-4 – Existing East Black Thunder Coal Preparation Facilities



3.3 Mining Equipment

Equipment utilized at the mine changes from year to year depending on several operational factors. In general, as older, smaller equipment is retired, it is replaced with new, larger equipment. Table 3-1 provides a listing of major mining equipment currently in use at the mine, and the equipment required to produce at a mining rate of 190 MMtpy.

Table 3-1
Black Thunder Mine
Mining Equipment

Equipment	Type/Size	Operating in 2014	Units to produce 190 MMtpy
Draglines	44-164 Yd^3	6	7
Shovels	36-85 Yd^3	22	28
Haul Trucks	210-400 ton	146	202
Front-End Loaders	4-54 Yd^3	12	13
Rubber Tired Dozers	Cat 854 or equivalent	8	10
Track Dozers	D10	4	9
	D11	36	41
Scrapers	Cat 637E	2	2
	Cat 657E	5	7
Graders	Cat 16H	3	8
	Cat 24H	17	20
Water Trucks	12,000 gal	1	1
	18,000 gal	1	1
	20,000 gal	1	1
	36,000 gal	2	2
	42,000 gal	6	6
	42,500 gal	2	2
	48,500 gal	3	8
Drills	10-12¼ inch dia	14	16

3.4 Disturbed Acreage

The Division considers acreage within the mine boundary that is subject to wind erosion as disturbed acreage. The Division requested that the applicant include a discussion regarding open acreage at the mine. A detailed description of the land status with respect to open or disturbed acreage was provided by the applicant. Some of the information was taken from the Land Quality Division (LQD) for the 2013 reporting year.

By the end of 2013, Thunder Basin Coal Company, LLC had disturbed approximately 29,561 acres at the Black Thunder Mine. Of that acreage, 12,870 acres (≈ 44%) were permanently reclaimed are considered stable. The remaining acres were considered to be Potential Open Acres which were further separated into two categories: *Pit* and *Other*.

Pit acreage is directly related to active coal pits, topsoil stripping, overburden removal and placement, stockpiling, and in-pit haul roads. Also included are mined but unreclaimed areas. *Pit* acreage accounts for approximately 6,095 acres or about 21% of the total disturbed acreage at the Black Thunder Mine.

Other includes all other disturbance areas not including the actual pit area such as preparation plants, facilities such as shops, warehouses, administrative offices, rail loops, inactive coal haul roads, mine access roads, monitoring sites, spoil and topsoil piles, and utility corridors. Thunder Basin Coal Company, LLC determined *Other* open acreage was 10,596 acres or 36% of the total area disturbed.

Table 3-2
Black Thunder Mine
Disturbed Acreage

	2013 Acres
Total Disturbed Acres	29,561
Total Reclaimed	12,870
Potential Open Acres	16,691
Potential Open Acres: Pit	6,095
Stabilized Acres: Pit	2,100
Actual Open Acres: Pit	**3,995**
Potential Open Acres: Other	10,596
Stabilized Open Acres: Other	7,500
Actual Open Acres: Other	**3,096**
Total actual open acres	**7,091**

The amount of open acreage utilized for the modeling was the total actual open acres. This quantity was then adjusted to reflect the volume of tons produced and ratio of overburden to coal. The applicant assumed that the current conditions in some aspects of mining were a reasonable representation for the model years. The basis for this assumption is that mine facilities are not expected to change significantly over the life of the mine and a program of contemporaneous reclamation is maintained which includes temporary reclamation practices that reduce areas subject to wind erosion. Haul road corridors will remain roughly the same through the life-of-mine (LOM).

4.0 ESTIMATED EMISSIONS

The applicant developed a summary of the mining activity for the Black Thunder Mine for all of the years in the mining plan, and then developed NO_x, PM_{10}, and $PM_{2.5}$ inventories from this information. $PM_{2.5}$ emissions for the mine are based on ratios applied to the PM_{10} emissions. These ratios were derived from AP-42, and consist of a ratio of 0.10 for unpaved roads and mining activities, and utilized a ratio of 0.15 for wind erosion. Table 4-1 shows the estimated fugitive/mobile source emissions from the Black Thunder Mine for the life-of-mine.

Table 4-1: Black Thunder Mine Fugitive/Mobile Source Emissions (tpy)			
Year	NO_x	PM_{10}	$PM_{2.5}$
2015	6,847	6,375	711.5
2016	6,945	6,512	727.2
2017	7,244	6,817	762.1
2018	7,264	6,816	762.7
2019	6,839	6,475	723.5
2020	7,110	6,787	757.3
2021	6,852	6,657	743.4
2022	7,071	6,901	771.1
2023	8,031	7,722	861.7
2024	7,120	6,769	758.2
2025	7,285	6,881	771.5
2026	5,256	5,212	586.1
2027	3,788	3,438	387.8
2028	3,589	4,111	460.9
2029	5,017	4,869	539.1
2030	5,459	5,043	556.0
2031	7,216	5,864	654.2

NO_x = nitrogen oxides
PM_{10} = particulate matter 10 microns in size or less
$PM_{2.5}$ = particulate matter 2.5 microns in size or less

5.0 CHAPTER 6, SECTION 3 – MAJOR SOURCE APPLICABILITY (TITLE V)

The Division determines major source applicability based on point sources and includes fugitive emissions from sources which are subject to new source performance standards, which were in effect as of August 7, 1980. The truck dumps at the mine are subject to a new source performance standard (Subpart Y); therefore, emissions from the truck dumps are counted toward major source applicability.

Truck dump particulate emissions are estimated at 54.5 tpy based on a maximum annual production rate of 190 MMtpy of coal using the near-pit truck dump with a control efficiency of 85%. NO_x, CO, and SO_2 are emitted from stationary sources at the mine. Table 5-1 shows the total major source applicable emissions for the Black Thunder Mine. Table 5-2 shows the particulate emission point sources at the mine and their respective controls. Baghouses at the mine are subject to emission limits under MD-14786.

Table 5-1: Major Source Applicability (tpy) [1]				
	PM_{10}	NO_x	SO_2	CO
Point Sources				
Boiler #1	8.2	13.9	12.9	30.6
Boiler #2	15.7	26.8	24.8	58.9
Propane Heaters	--	16.3	0.1	9.4
Used Oil Heater #1	--	0.1	<0.1	<0.1
Used Oil Heater #2	--	0.4	0.1	0.1
Detroit Emerg Gen #1	--	0.4	<0.1	0.1
Detroit Emerg Gen #2	--	0.4	<0.1	0.1
John Deere Emerg Gen #3	--	0.4	<0.1	0.1
Cummins Emerg Gen #4	--	0.4	<0.1	0.1
Detroit Emerg Gen #5	--	0.4	<0.1	0.1
Cummins Fire Pump (Utility Bldg)	--	0.2	<0.1	<0.1
Cummins Fire Pump (East)	--	0.2	<0.1	<0.1
Detroit Fire Pump (Silo)	--	0.2	<0.1	<0.1
Four (4) top-off system baghouses	6.1	--	--	--
Fugitives				
Truck Dump Emissions	54.5	--	--	--
Totals	**84.5**	**60.1**	**37.9**	**99.5**

[1] Point source emissions taken from Air Quality Permit MD-14786.
PM_{10} = particulate matter 10 microns in size or less
NO_x = nitrogen oxides
SO_2 = sulfur dioxide
CO = carbon monoxide

Table 5-2 **Black Thunder Mine** **Particulate Point Sources**		
Emission Unit Description	PM_{10}	
	lb/hr	tpy
Black Thunder		
Primary Crusher	Controlled with Atomizer/fogger system	
Secondary Crusher	Controlled with Atomizer/fogger system	
Belt 2902 Transfer	Controlled with Atomizer/fogger system	
Belt 2903 Transfer	Controlled with Atomizer/fogger system	
North Silo Headhouse	Controlled with Atomizer/fogger system	
Belt 2901 Transfer	Controlled with Atomizer/fogger system	
Belt 612 Transfer	Controlled with Atomizer/fogger system	
Belt 626 Transfer	Controlled with Atomizer/fogger system	
Belt 609 Transfer	Controlled with Atomizer/fogger system	
Near Pit Crusher #1	Controlled with Atomizer/fogger system	
Near Pit Crusher #2	Controlled with Atomizer/fogger system	
Near Pit Overland Conveyor Transfer	Controlled with Atomizer/fogger system	
5-West Crusher	Controlled with Atomizer/fogger system	

Table 5-2 Black Thunder Mine Particulate Point Sources		
Emission Unit Description	PM_{10}	
	lb/hr	tpy
Boiler #1 Baghouse	1.9	8.2
Boiler #2 Baghouse	3.6	15.7
Black Thunder West		
West Crusher	Controlled with Atomizer/fogger system	
West Overland Conveyor Transfer	Controlled with Atomizer/fogger system	
Black Thunder West Hilight		
Crusher	Controlled with Atomizer/fogger system	
Overland Conveyor Transfer	Controlled with Atomizer/fogger system	
Black Thunder East		
East Circuit #4 ROM Conveyor	Controlled with Atomizer/fogger system	
East Circuit #4 Overland Conveyor	Controlled with Atomizer/fogger system	
East Circuit #4 Surge Bin	Controlled with Atomizer/fogger system	
East Circuit #1 South Transfer	Controlled with Atomizer/fogger system	
East Circuit #2 North Transfer	Controlled with Atomizer/fogger system	
East Circuit #2 Storage Conveyor	Controlled with Atomizer/fogger system	
East Circuit #1 Storage Conveyor	Controlled with Atomizer/fogger system	
East Circuit #3 Storage Conveyor	Controlled with Atomizer/fogger system	
East #5 Belt	Controlled with Atomizer/fogger system	
East #6 Belt	Controlled with Atomizer/fogger system	
East #8 Belt	Controlled with Atomizer/fogger system	
East #A4 Belt	Controlled with Atomizer/fogger system	
East #9 Belt	Controlled with Atomizer/fogger system	
East #A2 Belt	Controlled with Atomizer/fogger system	
Coal Top-off Baghouse 1	0.35	1.53
Coal Top-off Baghouse 2	0.35	1.53
Coal Top-off Baghouse 3	0.35	1.53
Coal Top-off Baghouse 4	0.35	1.53
Total	**6.9**	**30.0**

As shown in Table 5-1, the Black Thunder Mine is not a "major source" as defined under Chapter 6, Section 3 of the Wyoming Air Quality Standards and Regulations (WAQSR), as emissions of any criteria pollutant from point sources and applicable fugitive emissions are less than 100 tons per year. Therefore, Thunder Basin Coal Company, LLC shall obtain an operating permit under Chapter 6, Section 2(a)(iii) of the WAQSR.

6.0 CHAPTER 6, SECTION 4 – PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

A major stationary source under Chapter 6, Section 4 of the Wyoming Air Quality Standards & Regulations (WAQSR) is a named facility which emits, or has the potential to emit, one hundred (100) tons per year or more of any air pollutant or any stationary source which emits or has the potential to emit two hundred and fifty (250) tons per year or more of any pollutant for which standards are established. The Black Thunder Mine is not a named source under Chapter 6, Section 4; therefore, the 250 tpy threshold is applicable to this facility. The proposed permitting action is not subject to Prevention of Significant Deterioration (PSD) review under Chapter 6, Section 4 of the WAQSR as applicable emissions are not 250 tpy or greater (see Table 5-1). Applicable emissions are emissions from point sources and fugitive emissions from named sources or from sources which were subject to an NSPS as of August 7, 1980.

7.0 CHAPTER 6, SECTION 13 – NONATTAINMENT PERMIT REQUIREMENTS

The Black Thunder Mine is located in an area that has been designated as unclassifiable/attainment for NO_2, PM_{10}, and $PM_{2.5}$. Therefore, this permitting action is not subject to the permitting requirements of Chapter 6, Section 13 of the WAQSR.

8.0 BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

8.1 Coal Dumping, Crushing, Processing & Preparation Facility Controls

8.1.1 Truck Dumps

In the revisions to Subpart Y, the EPA finalized a reference method for determining the opacity from truck dumps constructed, reconstructed, or modified after April 28, 2008, which is described in 40 CFR §60.255(h)(1)(i) and (ii). The Division is proposing that a demonstration of relative control effectiveness be conducted on a quarterly basis for existing truck dumps following the methodology specified in Subpart Y. If a control effectiveness demonstration is twenty percent (20%) opacity or greater than Thunder Basin Coal Company, LLC is to conduct an immediate inspection of the control system, and conduct corrective action, if necessary.

In addition, Subpart Y limits the opacity from truck dumps constructed, reconstructed, or modified after April 28, 2008 to an opacity of less than 10 percent. The Division considers the use of a stilling shed, and following the requirements of Subpart Y as being representative of BACT for coal truck dumps. The Division is proposing that a compliance demonstration for opacity be conducted at minimum once every calendar quarter, whereas Subpart Y requires a demonstration once every five (5) years. If a compliance demonstration is greater than ten percent (10%) opacity then Thunder Basin Coal Company, LLC will be required to conduct an immediate inspection of the stilling shed, and conduct corrective action, if necessary.

Weekly inspections of the stilling sheds shall be conducted by Thunder Basin Coal Company, LLC to determine any repair measures necessary to minimize fugitive dust emissions and maintain proper operation of the control systems. Corrective action and repair measures must be initiated in an expeditious manner when the control device is determined to be improperly maintained or operated.

Truck dump pads in front of stilling shed and hoppers have been identified as sources of fugitive dust as pulverized material that accumulates on pads due to spillage is easily disturbed by truck traffic. Cleaning practices at the Black Thunder Mine shall be adequate to control fugitive dust emissions in these areas.

8.1.2 Atomizer/Fogger Systems

Thunder Basin Coal Company, LLC currently utilizes atomizer/fogger systems at transfer points associated with the coal preparation facilities. The Division considers atomizer/fogger systems to be as efficient as traditional baghouse control devices which have been considered to represent BACT for these types of applications, and is satisfied that atomizer/fogger systems can operate as effective control devices on a continuous basis.

The atomizer/fogger systems are to be operated and maintained so that the system enclosures exhibit no visible emissions. As a condition of the permit, the Division will establish a no visible emissions limit on the atomizer/fogger systems as determined by Method 22 of appendix A, 40 CFR part 60. Thunder Basin Coal Company, LLC is to conduct daily inspections of each of the atomizer/fogger systems to determine the presence of visible emissions. Results of the daily observations are to be recorded, and if any emissions are noted, immediate corrective action is to be taken.

8.1.3 Baghouses

Baghouses are utilized at the existing coal preparation facilities to control fugitive dust emissions. These baghouses are addressed in Thunder Basin Coal Company, LLC's synthetic minor permit MD-14786, which limits the baghouses to a PM_{10} emission rate and requires a daily visible emissions check. No changes are being proposed that would modify the baghouses or the mine's major source applicability; therefore, the baghouses will not be addressed in the proposed permit conditions. For reference the baghouses at the mine are shown in Table 8-1 along with their respective emissions limit from MD-14786.

Table 8-1: Baghouse Particulate Emissions (PM_{10})

Source ID	Description	lb/hr	tpy
Boiler 1	Boiler #1 Baghouse	1.9	8.2
Boiler 2	Boiler #2 Baghouse	3.6	15.7
Top-off system	Four Coal Top-off Baghouses	0.35	6.1

8.2 Haul Road Dust Control Program

Thunder Basin Coal Company, LLC operates a dust control program that involves the use of large volumes of water and dust suppressants on roads. Use of water and chemical application varies depending upon specific circumstances such as the location and duration of mining activities, the amount of precipitation, and the residual chemicals remaining from prior treatments. Contractors utilized by the mine for topsoil salvage and replacement activities provide water trucks for dust control in their work areas. In general, depending upon weather conditions, less water is applied in the winter and early spring. Summer and fall are the peak demand seasons for water application.

Historical use of water and dust suppressant are summarized in Table 8-2, which also shows the number of water trucks and total water truck operating hours at the Black Thunder Mine.

Table 8-2: Historical Water and Chemical Dust Suppressant Usage [1]

Year	Production Coal (MMtpy)	Production OB (MMbcy)	Number & Size of Water Truck	Water Usage (gal)	$MgCl_2$ Usage (gal)
2011	104.9	373.0	2 -12,000 gallon 1 - 18,000 gallon 1 – 20,000 gallon 3 – 36,000 gallon 6 – 42,000 gallon 2 -42,500 gallon 3 – 48,500 gallon	838,775,644	447,407
2012	92.9	364.0	2 -12,000 gallon 1 - 18,000 gallon 1 – 20,000 gallon 3 – 36,000 gallon 6 – 42,000 gallon 2 -42,500 gallon 3 – 48,500 gallon	1,203,940,174	314,814
2013	100.7	400.9	1 -12,000 gallon 1 - 18,000 gallon 1 – 20,000 gallon 2 – 36,000 gallon 6 – 42,000 gallon 2 -42,500 gallon 3 – 48,500 gallon	1,050,940,174	188,888

[1] Based on dust control reports submitted to AQD each year.

8.3 Disturbed Acreage

The Division considers acreage within the mine boundary that is subject to wind erosion as disturbed acreage. Contemporaneous reclamation helps minimize wind erosion from mined areas. Vegetation of soil is done in a timely manner to help minimize wind erosion emissions. Permanent reclamation is done as soon as possible after mining is completed, and seeding occurs during the first favorable planting conditions. Temporary revegetation is not only used to prepare reclaimed areas for permanent reclamation, but is the main method for minimizing emissions from wind erosion. Temporary revegetation is also utilized to minimize windblown dust from areas that may be inactive for long periods of time. Windrows are bladed in pit advance areas where topsoil has been stripped. Topsoil stockpiles and sediment control structures are seeded during the first normal period favorable for planting. Surface preparation techniques, some of which include mulching, surface pitting or contour ripping, are used to control wind erosion and vegetation growth.

8.4 Coal Fires

Thunder Basin Coal Company, LLC operates a program to mitigate natural or accidental coal fires at the Black Thunder Mine. All employees are responsible for reporting coal fires when they are discovered. Operations personnel will determine the best way to handle a particular fire. Common practices used in extinguishing coal fires include digging them out and burying them in backfill, smothering them with overburden, or using water. Reported fires are to be extinguished within 24 hours unless operational safety issues prevent accessing the area. For significant fires, operation personnel will document the measures utilized to extinguish the fire as well as the timeframe it took to extinguish the fire.

8.5 Other BACT Practices Addressed at the Black Thunder Mine Include:

- The access road to the mine has been paved, and parking areas have been paved wherever practical.

- Emissions from coal conveying at the coal preparation plant are reduced through the use of covered conveyors and coal storage silos.

- Thunder Basin Coal Company, LLC has committed to the use of water on temporary haul roads.

- Overburden loading and coal loading emissions are controlled by limiting the drop height between the bucket and truck bed.

- At the coal loadouts, emissions are controlled through the use of telescoping chutes which limit the drop height of coal into the train cars.

9.0 NEW SOURCE PERFORMANCE STANDARDS (NSPS)

The coal preparation facilities at the Black Thunder Mine are subject to 40 CFR part 60, subpart Y. Subpart Y limits the opacity from sources which have been constructed, reconstructed, or modified before April 28, 2008 to less than 20 percent as determined by Method 9 of 40 CFR part 60, appendix A. Sources which have been constructed, reconstructed, or modified after April 28, 2008 are subject to an opacity limit of less than 10 percent as determined by Method 9 of 40 CFR part 60, appendix A. The existing coal preparation facilities at the Black Thunder Mine are subject to an opacity standard of less than 20 percent as the coal preparation facilities are not being modified. The proposed West Hilight coal preparation facilities will be subject to an opacity standard of less than 10 percent.

10.0 PROJECTED IMPACT ON EXISTING AMBIENT AIR QUALITY

10.1 OVERVIEW OF MODELING ANALYSIS

10.1.1 Project Overview

The application proposes to modify the coal removal progression and to modify the Lands Necessary to Conduct Mining (LNCM) boundary. In addition, a new truck dump and associated coal preparation facilities (West Hilight) will be constructed on the west side of the mine which will connect into the existing west loadout facilities at the mine. Because of these changes, the Division required the applicant

to conduct an ambient air quality analysis to predict impacts from emissions of particulate matter less than 10 microns in diameter (PM_{10}) and nitrogen oxides (NO_x), and to assess the impact of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) and ozone (O_3).

10.1.2 Model Selection

The applicant used the Environmental Protection Agency (EPA) Industrial Source Complex Long-Term Model (ISCLT3, version 96113) to evaluate concentrations of PM_{10} and nitrogen dioxide (NO_2) to compare to the Wyoming Ambient Air Quality Standards (WAAQS). The ISCLT3 dispersion model is a steady-state, Gaussian dispersion model designed to predict ground-level pollutant concentrations from a variety of sources associated with industrial complexes such as surface coal mines.

Current Division policy does not endorse modeling to predict short-term (24-hour) ambient impacts from fugitive dust particulate sources. Modeling is not believed to be viable for the prediction of 24-hour impacts because of the high degree of uncertainty in short-term emissions estimates for fugitive sources and the uncertainty in the treatment of fugitive sources in the EPA models themselves. Therefore, the PM_{10} modeling analysis was conducted to determine only long-term (annual) average PM_{10} ambient concentration estimates.

The modeling analysis was conducted to evaluate impacts from the Black Thunder Mine and the neighboring mines in the South Group of Mines in the PRB. Additionally, the NO_x ambient impact analyses included emissions from regional sources, including coal bed methane (CBM) facilities, power plants, highways, rail lines, and the town of Wright.

The ISCLT3 model simulations were run with the EPA-recommended regulatory default options, including rural dispersion coefficients with no exponential decay, final plume rise, default wind profile exponents, and default vertical potential temperature gradients.

10.1.3 Meteorological Data

Black Thunder Mine sources were modeled with meteorological data collected at the nearby North Antelope Rochelle Mine (NARM) during a five-year period from 2000-2004. In addition, Antelope Mine sources were modeled with meteorological data based on hourly measured values of wind speed, wind direction, and wind direction fluctuations (stability) derived from on-site data collected at Antelope Mine (1995-2000). Modeling results were then added together to determine final receptor concentrations. The hourly meteorological data from both sets were converted into a joint frequency distribution (JFD) in the STability ARray (STAR) format recognized by the ISCLT3 model. A wind rose representing the average surface wind patterns from the NARM data is shown in Figure 10-1, with a wind rose representing the average surface wind patterns from the Antelope Mine data shown in Figure 10-2.

Figure 10-1: Wind Rose for NARM (2000-2004)

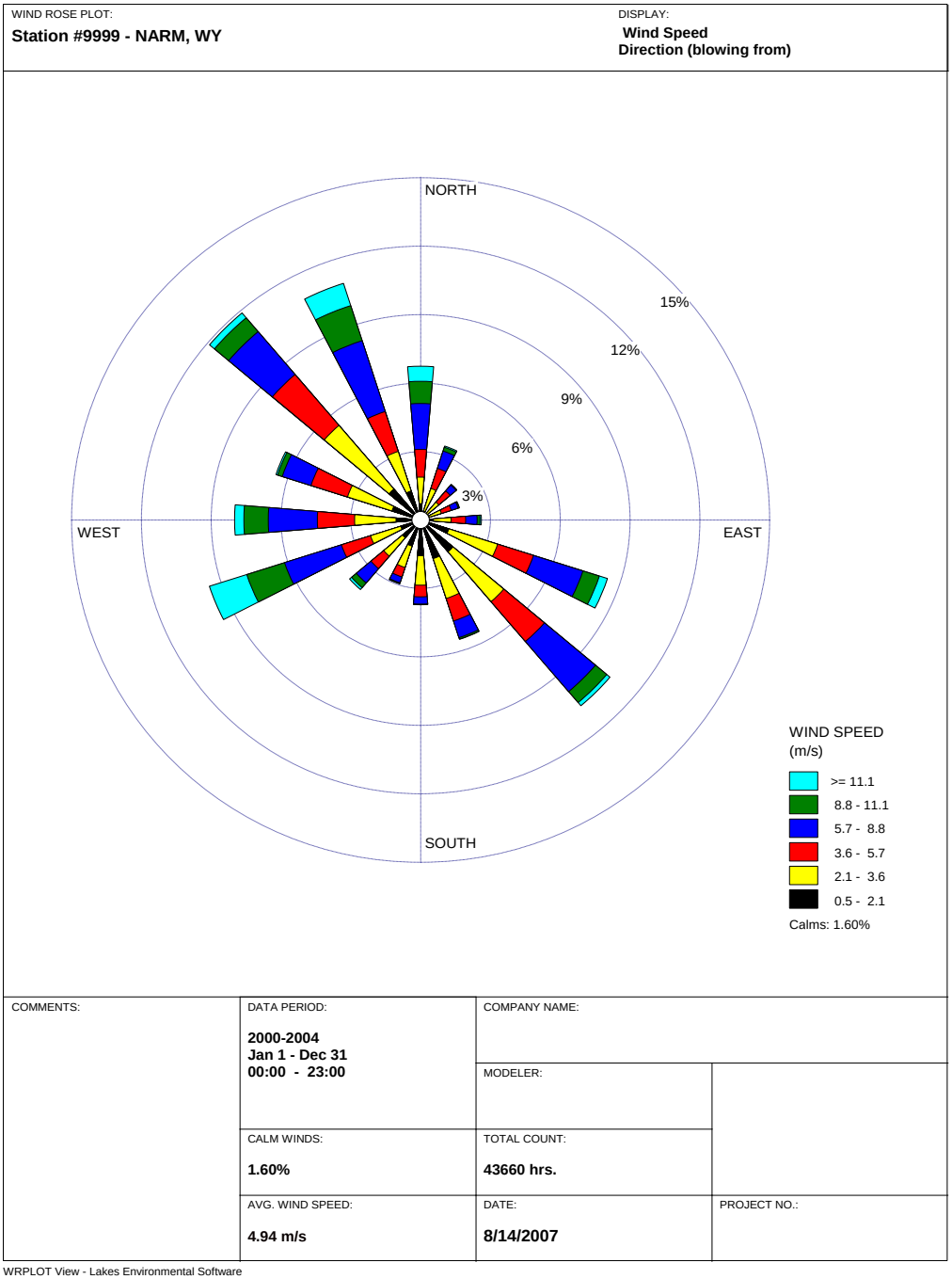
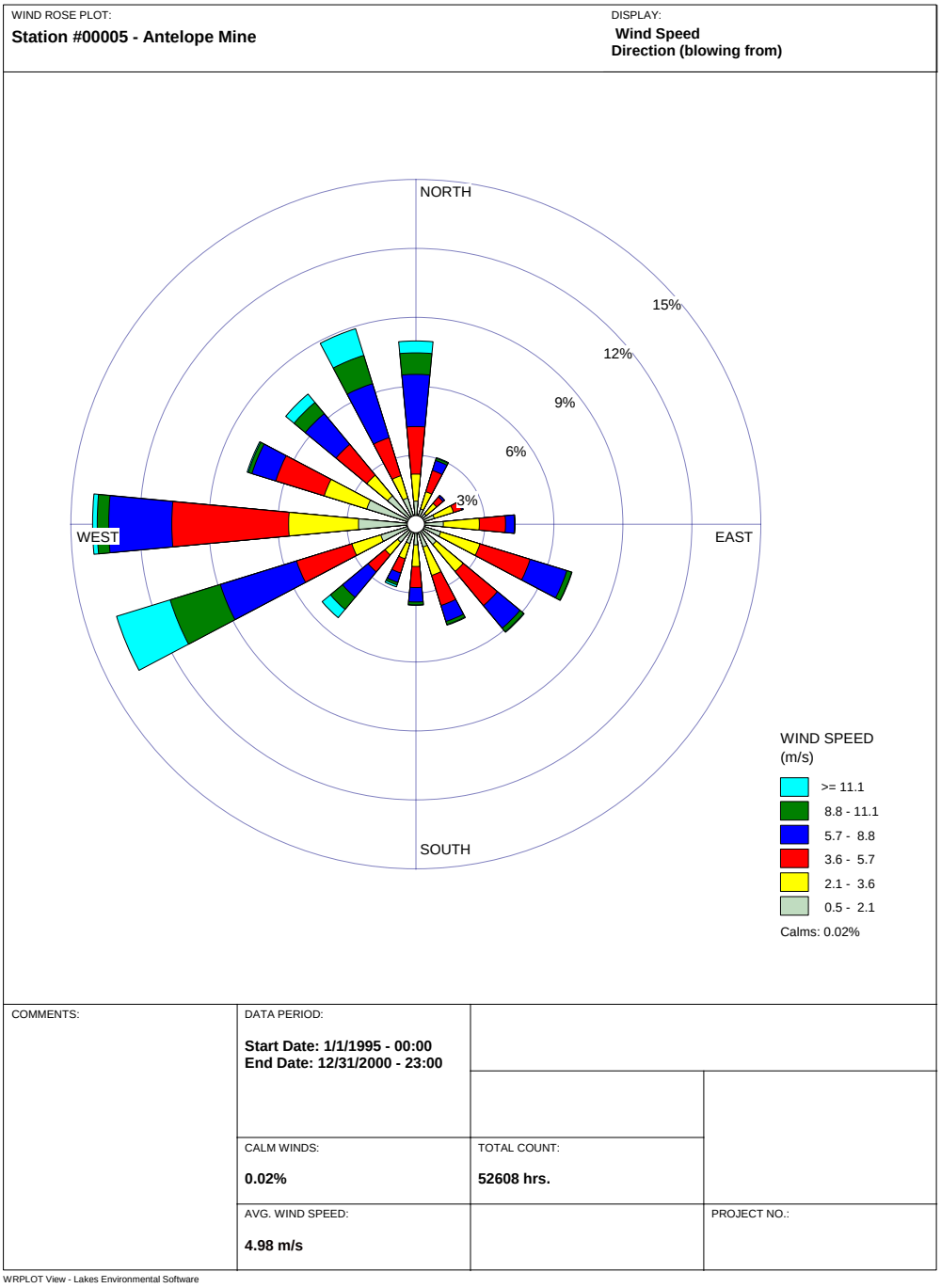


Figure 10-2: Wind Rose for Antelope (1995-2000)

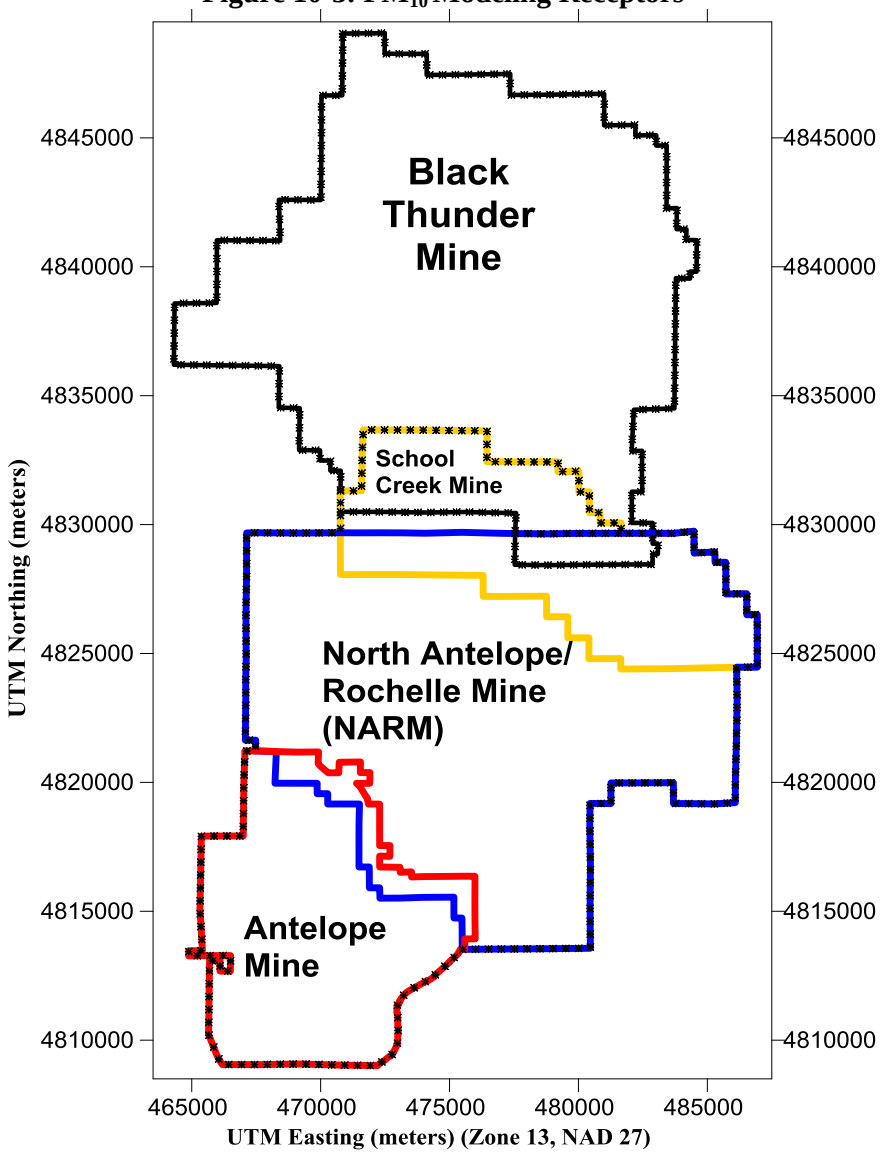


10.1.4 Modeling Receptors

The receptors used in the modeling analyses were developed separately for the PM_{10} and NO_2 modeling simulations. The modeling analysis for PM_{10} was conducted using discrete Cartesian receptors placed at 500-meter intervals along the LNCM boundaries for the South Group of Mines.

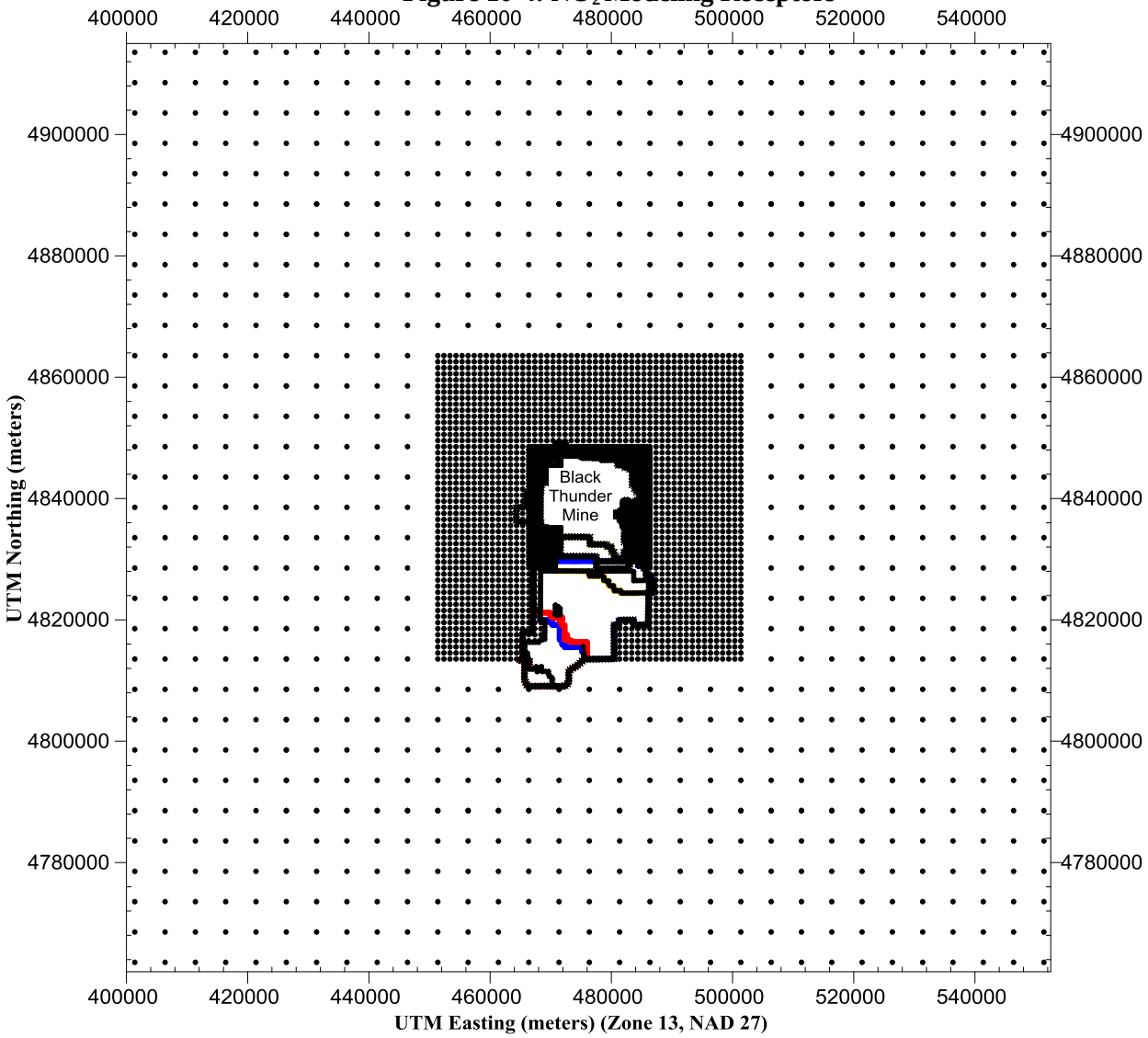
At School Creek Mine, NARM and Black Thunder Mine, receptors were placed along the overlapping LNCM boundaries to allow the AQD's "Mine A/Mine B" policy to be used. For example, in a case where a Black Thunder receptor is located within School Creek's LNCM, the contribution from School Creek is not added to the cumulative total, and vice versa. Figure 10-3 shows the receptor grid used for the PM_{10} modeling.

Figure 10-3: PM_{10} Modeling Receptors



The NO_2 receptor grid is shown in Figure 10-4. This grid, which included the LNCM receptors, was designed to capture the full extent of the significant impact from Black Thunder sources, i.e., the predicted impacts of 1.0 µg/m^3 or more for an annual averaging period.

Figure 10-4: NO_2 Modeling Receptors



10.2 ANALYSIS OF SHORT-TERM PM_{10} and $PM_{2.5}$ IMPACTS

10.2.1 Short-Term (24-hour) Modeling

As stated previously, current Division policy does not endorse short-term (24-hour) modeling exercises for predicting short-term ambient impacts from fugitive dust particulate emissions. Therefore, dispersion modeling was used to determine long-term (annual) average PM_{10} ambient concentrations only.

Section 234 of the 1990 Clean Air Act Amendments required the Administrator of the Environmental Protection Agency to analyze the accuracy of short-term modeling in regard to fugitive particulate emissions from surface coal mines. A June 26, 1996 EPA Region VIII letter to Wyoming Congressional Representatives states that the results of the study indicate the model fails to meet evaluation criteria and tends to overpredict 24-hour impacts from surface coal mines. The State and EPA Region VIII entered into a Memorandum of Agreement on January 24, 1994 (summarized in 60 CFR 47290 on 9/12/95) which allows the Division to conduct monitoring in lieu of short-term modeling for assessing particulate concentrations.

10.2.2 Historical Particulate Ambient Monitoring

Ambient air monitoring data has been collected by the mining community in the Powder River Basin for over twenty (20) years. Initially, concentrations were measured as TSP, but in 1989, PM_{10} monitors were being installed at various sites throughout the basin. All monitoring was being conducted on a one-in-six day schedule. However, in the early part of 2001, PM_{10} readings in excess of 150 $\mu g/m^3$ were being recorded in the southern area of the basin. In a letter from the Division dated October 26, 2001, the mines in the Powder River Basin (PRB) were notified that the waiver the Division had issued in 1997 allowing monitoring on a one-in-six day (1/6) schedule had been revoked. As of January 2002, all the PM_{10} monitoring sites in the PRB were required to conduct monitoring on a one-in-three day (1/3) schedule. This mandate did not apply to PM_{10} monitors currently operating on an everyday (1/1) schedule, PM_{10} monitors already on a 1/3 day schedule, or to any existing TSP monitors on a 1/6 day schedule. Additionally, a mine that had been monitoring TSP would be allowed to follow a one-in-six day sampling schedule until such time a 24-hour TSP concentration in excess of 150 $\mu g/m^3$ was recorded or an annual average TSP concentration in excess of 50 $\mu g/m^3$ was recorded.

10.2.2.1 Black Thunder Mine

Ambient particulate data at the Black Thunder Mine is currently gathered by three PM_{10} high volume samplers (25-3, 25-4, 25-5) three PM_{10} low volume samplers (9-1, 9-2, 3A) and two R&P TEOM continuous monitors (36 Site, JR5). The 3B sampler was decommissioned on May 28, 2014. Samplers 25-3, 25-4 alternate sampling every third day to facilitate a 1-in-3 day sampling schedule. Precision samplers 25-4 (primary) and 25-5 (duplicate) are measured on the national 1-in-6 day schedule. PM_{10} low volume samplers 9-1 and 9-2 alternate sampling every third day to facilitate a 1-in-3 day sampling schedule. Meteorological data is also monitored at two (2) locations at the mine. The location of the monitoring sites and meteorological sites are shown in Figure 3-1. Continuous monitoring at JR-4 ended in June 2012 and continuous monitoring at Site 12 ended in June 2013. Table 10-1 presents that ambient monitoring data from 2012 through the 1st quarter of 2015.

Table 10-1: Black Thunder Mine
Historical Ambient Data (µg/m^3) and Production
(WAAQS PM_{10} Standards = 50 µg/m^3 Annual, 150 µg/m^3 24-Hour)

Year	Site	Annual Average	High 24-Hour	2nd High 24-Hour	Coal MMtpy	OB MMbcy
2012	3	26.9	110	85.0	92.9	364.0
	9	21.4	83	63.0		
	12	32.3	121.1	120.6		
	25	12.4	39.0	39.0		
	36	27.7	87.7	83.3		
	JR-4	10.6	34	20.0		
	JR-5	27.3	124.1	121.1		
2013	3	20.5	66.0	58.0	100.7	400.9
	9	19.4	97	66		
	12	19.4	86.9	62.0		
	25	10.7	36.0	34.0		
	36	22.8	166.6 [2]	71.7		
	JR-4	--	--	--		
	JR-5	22.1	99.5	79.0		
2014	3	19.3	52.8	35.3	101.2	385.0
	9	12.6	33.3	30.5		
	12	--	--	--		
	25	10.7	33	33		
	36	24.3	85.9	82.2		
	JR-4	--	--	--		
	JR-5	21.0	90.4	71.4		
2015[1]	3	13.2	45.8	27.1	n/a	n/a
	9	9.4	39	19		
	12	--	--	--		
	25	9.4	39.0	19.0		
	36	30.9	143.7	70.3		
	JR-4	--	--	--		
	JR-5	21.0	117.3	66.2		

[1] Data through the 1st quarter of 2015
[2] An exceptional event packet was submitted to have the data flagged as a result of high winds. The AQD approved the packet and it was sent to EPA for approval.

On March 4 2013, a PM_{10} concentration greater than 150 µg/m^3 was recorded at Site 36. Thunder Basin Coal Company, LLC submitted an exceptional event packet to the Division to flag the data as due to high wind. The Division reviewed the packet and determined that the monitored concentration was the result of high wind, and that Thunder Basin Coal Company, LLC had satisfied all requirements of §50.14 for the event to be flagged as an exceptional event. The Division is currently awaiting for EPA's concurrence that the monitored concentration was the result of an exceptional event. Based on a review of all of the ambient monitoring data from the Black Thunder Mine monitoring network, the data demonstrates that the Black Thunder Mine is in attainment with the 24-hour standard for PM_{10}.

10.2.2.1.1 Monitor Siting

Since the issuance of air quality permit MD-3851 (August 18, 2008) for the Black Thunder Mine, Thunder Basin Coal Company, LLC has been required to submit on an annual basis, a demonstration that the ambient particulate monitoring network is sufficient for monitoring impacts from current as well as future (5-year projection) mining activities. This demonstration has consisted of a discussion of the ambient monitoring network along with an annual windrose, and current UTM coordinate locations of the monitors. Additionally, a map showing current monitor locations in relation to active mining areas, along with projected mining areas, has been included. The monitor siting demonstration will be incorporated into this permit. Monitor locations and/or changes are dependent upon concurrence with the Air Quality Division – Monitoring Program, power availability for the sites, and landowner agreements for these sites.

10.2.2.1.2 Action Plan

Thunder Basin Coal Company, LLC has established a contingency action plan for high particulate events at the Black Thunder Mine. A copy of this plan titled *Dispatch Air Quality Event Action Plan* is attached to this analysis in Appendix A. This plan has been reviewed by the Division, and consists of actions that are to be taken if a continuous monitor value reaches a trigger level. The Division is incorporating, as a condition of the permit, a requirement that Thunder Basin Coal Company, LLC document what actions were taken when an action level was triggered under the air quality action plan. In addition, the Administrator may require a demonstration that the action plan is sufficient for minimizing particulate emissions based on a reading greater than 150 $\mu g/m^3$. A request from the Administrator for a demonstration of an action plan will be based on all the facts, such as the number, frequency and magnitude of the monitor reading(s) greater than 150 $\mu g/m^3$ (24-hour average from midnight to midnight).

10.2.2.1.3 Best Management Practices (BMP)

As discussed in the BACT analysis for disturbed acreage, the Division considers acreage within the mine boundary that is subject to wind erosion as disturbed acreage, and contemporaneous reclamation helps minimize wind erosion from mined areas. Currently, the Division is evaluating disturbed acreage as a source category where particulate emission reductions could be achieved. Based on information the Division had received under the Natural Events Action Plan (NEAP), wind erosion from disturbed acreage directly influenced monitored impacts at the mines. Under the NEAP, Thunder Basin Coal Company, LLC was required to follow Category I control measures which were considered BACT measures and were enforceable as permit requirements. Additionally, under the NEAP, Thunder Basin Coal Company, LLC could follow Category II and III control measures which were considered "Best Available Control Measures" and "Reactionary Control Measures," respectively. These were measures a mine could implement prior to high wind events, and during high wind events, to help prevent high monitor readings such as ripping disturbed areas, and minimizing/shutting down activities in areas identified as being sources of emission during high wind events.

In order to develop a consistent approach across all coal mines for disturbed acreage, the Division is requiring mines to document particulate emission reduction control measures and best management practices applied to disturbed acreage. On an annual basis, mines will be required to submit a report on the amount of disturbed acreage for the previous calendar year. The report is to contain the total acreages treated during the past calendar year using control measures or best management practices (BMP). This report will be part of the annual report required for dust control measures.

The Division will establish an acreage threshold of 150 contiguous acres where topsoiled areas greater than or equal to 150 contiguous acres that will not be revegetated within sixty (60) days of completion of topsoil laydown and regraded backfill areas greater than or equal to 150 contiguous acres that will not be topsoiled within sixty (60) days, shall be ripped or chiseled to create a roughened surface, seeded with a temporary vegetative cover, or otherwise effectively stabilized against wind erosion. For topsoiled areas less than 150 contiguous acres that will not be revegetated and regraded backfill areas less than 150 contiguous acres that will not be topsoiled, stabilization is required as soon as feasible.

10.2.2.2 South Group of Mines

Historical ambient monitoring discussed in this section will address only the southernmost group of mines which includes the Black Thunder, School Creek, North Antelope Rochelle, and Antelope mines. All the concentrations noted in the following discussions are reported at standard temperature and pressure (STP) conditions.

The School Creek Mine collects ambient data at three continuous monitors: SC1, SC2, and SC3. The North Antelope Rochelle Mine currently conducts ambient monitoring at three sites: NA-7, NA-8, and RO-1. These monitors operate on a continuous basis. The Antelope Mine currently conducts ambient monitoring at four sites: ANT-4, ANT-5, ANT-6, and ANT-7. Sites ANT-4 and ANT-5 operate on a 1 in 3 day schedule, while ANT-7 operates on a 1 in 6 day schedule. ANT-6 operates on a continuous basis. Table 10-2 shows the monitored values for mines neighboring the Black Thunder Mine in the South Group for PM_{10}.

Table 10-2: Powder River Basin – South Group of Mines
Production and Historical Ambient Data
(WAAQS PM_{10} Standards = 50 µg/m^3 Annual, 150 µg/m^3 24-Hour)

Mine	Monitor ID	2015		2014		2013		2012	
		High 24-Hour	2nd High 24-Hour	High 24-Hour	2nd High 24-Hour	High 24-Hour	2nd High 24-Hour	High 24-Hour	2nd High 24-Hour
Black Thunder	3	45.8	27.1	52.8	35.3	66.0	58.0	110	85.0
	9	39	19	33.3	30.5	97	66	83	63.0
	12	--	--	--	--	86.9	62.0	121.1	120.6
	25	39.0	19.0	33	33	36.0	34.0	39.0	39.0
	36	143.7	70.3	85.9	82.2	166.6 [2]	71.7	87.7	83.3
	JR-4	--	--	--	--	--	--	34	20.0
	JR-5	117.3	66.2	90.4	71.4	99.5	79.0	124.1	121.1
School Creek	SC1	56.6	55.2	62.0	61.4	63	61	102	60
	SC2	151.2	139.9	113.9	112.8	127	118	223 [2]	143 [2]
	SC3	154.0	107.0	171.2 [3]	108.7	125	108	226 [2]	115 [2]
North Antelope Rochelle	NA-5	--	--	--	--	--	--	127	85
	NA-7	59.6	59.1	77.4	61.6	59	53	61	57
	NA-8	276.1 [4]	94.9	80.0	64.1	107	105	74	74
	RO-1	190.8 [4]	130.3	104.8	95.6	148	122	132	108
Antelope	3	--	--	--	--	34	26	46	30
	4	63.2	45.5	61.1	59.9	56	55	62	61
	5	108.9	58.5	65.4	63.2	107	72	76	67
	6	174.9 [4]	58.7	124.8	91.8	152	108	154	106
	7	10.3	8.7	--	--	--	--	--	--
Total Coal Production (MMTPY)		n/a		252.82		243.06		234.06	
Total Overburden Removal (MMBCY)		n/a		989.87		949.45		912.77	

[1] Monitoring data through the 1st quarter of 2015.
[2] An exceptional event packet was submitted to have the data flagged as a result of high winds. The AQD approved the packet and it was sent to EPA for approval.
[3] A notice of violation (NOV) was issued for this exceedance (5571-15).
[4] As of the date of this analysis, the Division is waiting to see if exceptional event packets will be submitted for these events, prior to taking any regulatory action on these events.

In looking at the annual ambient monitored PM_{10} concentrations within the South Group of Mines for the past three (3) years as presented in Table 10-2, there does not appear to be a direct correlation with coal and overburden production and monitored PM_{10} concentrations. It is difficult to determine if PM_{10} particulate concentrations are due solely to mining activity when concentrations could be due to a combination of factors, including drought conditions, coal bed natural gas production, and increased traffic on unpaved roads. In addition, because monitoring is done continuously at sites SC-3, NA-8, RO-1 and 6, Appendix K procedures were applied to the monitoring data. The estimation was less than 1.0 exceedance per year for the three (3) year period (2013 through 2015). Therefore, the SC-3, NA-8, RO-1 and 6 monitoring sites do not fail the attainment test and continue to show attainment with the 24-hour PM_{10} standard. Therefore, based on a review of all of the ambient monitoring data from the South Group, the data demonstrates that the South Group is in attainment with the 24-hour standard PM_{10}.

10.2.3 $PM_{2.5}$ IMPACTS

The Division operates a $PM_{2.5}$ sampler at Black Thunder Mine's 36 monitoring site. The sampler operates for 24 hours every 3rd day, in accordance with EPA sampling guidelines. Table 10-3 presents a summary of the recent data from the sampler, and all monitored values are well below the NAAQS.

Table 10-3: Monitored $PM_{2.5}$ at the Black Thunder Mine (µg/m^3)

Year	Annual Average $PM_{2.5}$	Annual $PM_{2.5}$ NAAQS	98th Percentile 24-Hour Average $PM_{2.5}$	24-Hour $PM_{2.5}$ NAAQS
2012	4.9	12	16	35
2013	4.2		14	
2014	3.9		10	
3-Year Average	4.3		13	

Notes:
1) To attain the annual standard, the 3-year average of the annual mean $PM_{2.5}$ concentrations must not exceed 12.0 µg/m^3
2) To attain the 24-hour standard, the 3-year average of the 98th percentile of 24-hour concentrations must not exceed 35 µg/m^3

Given the nature of the proposed modification and associated emissions from the Black Thunder Mine, and the measured $PM_{2.5}$ concentrations near the mine, the proposed modification will not prevent the attainment or maintenance of air quality standards for $PM_{2.5}$.

10.3 ANALYSIS OF LONG-TERM PM_{10} IMPACTS

10.3.1 PM_{10} Emission Inventories/Selection of Worst Case Years

The applicant developed a summary of the mining activity proposed for the Black Thunder Mine for all of the years in the mining plan, and then developed fugitive PM_{10} inventories from this information. Similar inventories were developed for the nearby mines, which include the existing School Creek, NARM, and Antelope mines. Because it is not practical to model all of the years in the life of the mines, the applicant compared life-of-mine fugitive emissions for the mines, and determined the years which would likely yield the highest modeled impacts. These "worst-case" years were modeled and the results were compared to the annual ambient air quality standard. If the maximum predicted impacts from the worst-case years are below the standard, then it is assumed that the impact from other years in the life of the mine will fall below the ambient standard.

Fugitive and point source emissions for the nearby mines were taken from the most recent permits or permit applications that reflect the currently permitted or proposed configurations at the mines. Annual fugitive PM_{10} emissions were summarized and evaluated, not just as to the highest total, but also the location of the mining activity in relation to LNCM boundaries. If the distance from the mining activity to the LNCM boundary is small, impacts to the receptors along the LNCM boundary may be higher. Point source emissions are assumed not to vary significantly from year to year and are usually excluded from the process of selecting the worst-case years.

Based on the operating parameters and projected fugitive PM_{10} emission inventories for the South Group of Mines, the years 2018 and 2023 were selected to represent the "worst-case" years to simulate in the modeling analyses for PM_{10}. Year 2018 was selected as it represents the highest regional PM_{10} emissions within the next five (5) years and 2023 was chosen as it represents the highest total emissions from the South Group of Mines and from Black Thunder Mine itself. Those two years were also used to model NO_2 impacts. Table 10-4 presents calculated fugitive PM_{10} emissions for the Black Thunder Mine for the two (2) modeled years.

Table 10-4: Black Thunder Mine Estimated Fugitive PM_{10} Emissions (2018 and 2023)

Emission Source	2018 PM_{10} Emission Rate (tpy)	2023 PM_{10} Emission Rate (tpy)
Scraper	48.39	48.39
Overburden Removal (dragline)	1,217.26	1,210.82
Overburden Removal (shovel)	1,864.61	2,194.34
Coal Removal (shovel)	59.85	59.85
Coal Dumping	54.51	54.51
Wind Erosion	834.37	948.14
Overburden Haul Road	965.14	1,138.63
Coal Haul Road	985.77	1,197.90
Grader	318.36	383.20
Dozer	407.84	416.82
Water Trucks	45.91	55.26
Overburden Blasting	8.37	8.89
Coal Blasting	5.34	5.34
Overburden Drilling	0.57	0.35
Coal Drilling	0.12	0.07
Totals	6,816.41	7,722.51

tpy = tons per year

Calculated fugitive emissions as presented by the applicant for the South Group of Mines are shown in Table 10-5.

Table 10-5: South Group of Mines
Fugitive PM_{10} Emission Summaries (tpy)

Year	Black Thunder	School Creek	NARM	Antelope	Totals
2015	6,375	1,051	3,645	2,153	13,224
2016	6,512	916	3,676	2,367	13,471
2017	6,817	992	3,674	2,519	14,002
2018	6,816	1,035	3,501	2,792	14,144
2019	6,475	1,081	3,703	2,716	13,975
2020	6,787	1,109	3,793	2,712	14,401
2021	6,657	1,252	3,858	2,757	14,524
2022	6,901	1,158	3,975	2,809	14,843
2023	7,722	1,134	3,471	2,802	15,129
2024	6,769	1,150	3,383	2,821	14,123
2025	6,881	1,123	3,314	2,781	14,099
2026	5,212	1,126	3,320	2,781	12,439
2027	3,438	1,096	3,366	2,780	10,680
2028	4,111	1,138	3,274	2,801	11,324
2029	4,869	833	3,632	2,827	12,161
2030	5,043	--	--	2,858	7,901
2031	5,864	--	--	1,656	7,520

The emission rates associated with each of the mines for the worst-case years were verified by the Division, and these calculations are contained in Appendix B (2018) and C (2023) of this analysis.

10.3.2 Emissions Apportioning

Fugitive emissions for the worst-case years were apportioned into multiple area and volume sources based on the location and extent of mining activities.

A detailed accounting of the apportioned particulate emissions and sources is contained in the permit application. The area/volume sources that were used to represent the 2018 and 2023 PM_{10} emissions at the mines in the South Group are shown in Figures 10-5 and 10-6.

Fugitive and point source emissions for NARM were taken from the permit application for Permit MD-16282. Fugitive and point source emissions for the Antelope Mine were taken from the permit application for Permit MD-13361, and similar information for the School Creek Mine was obtained from the permit application for Permit MD-6445.

Figure 10-5: Fugitive PM_{10} Sources for 2018

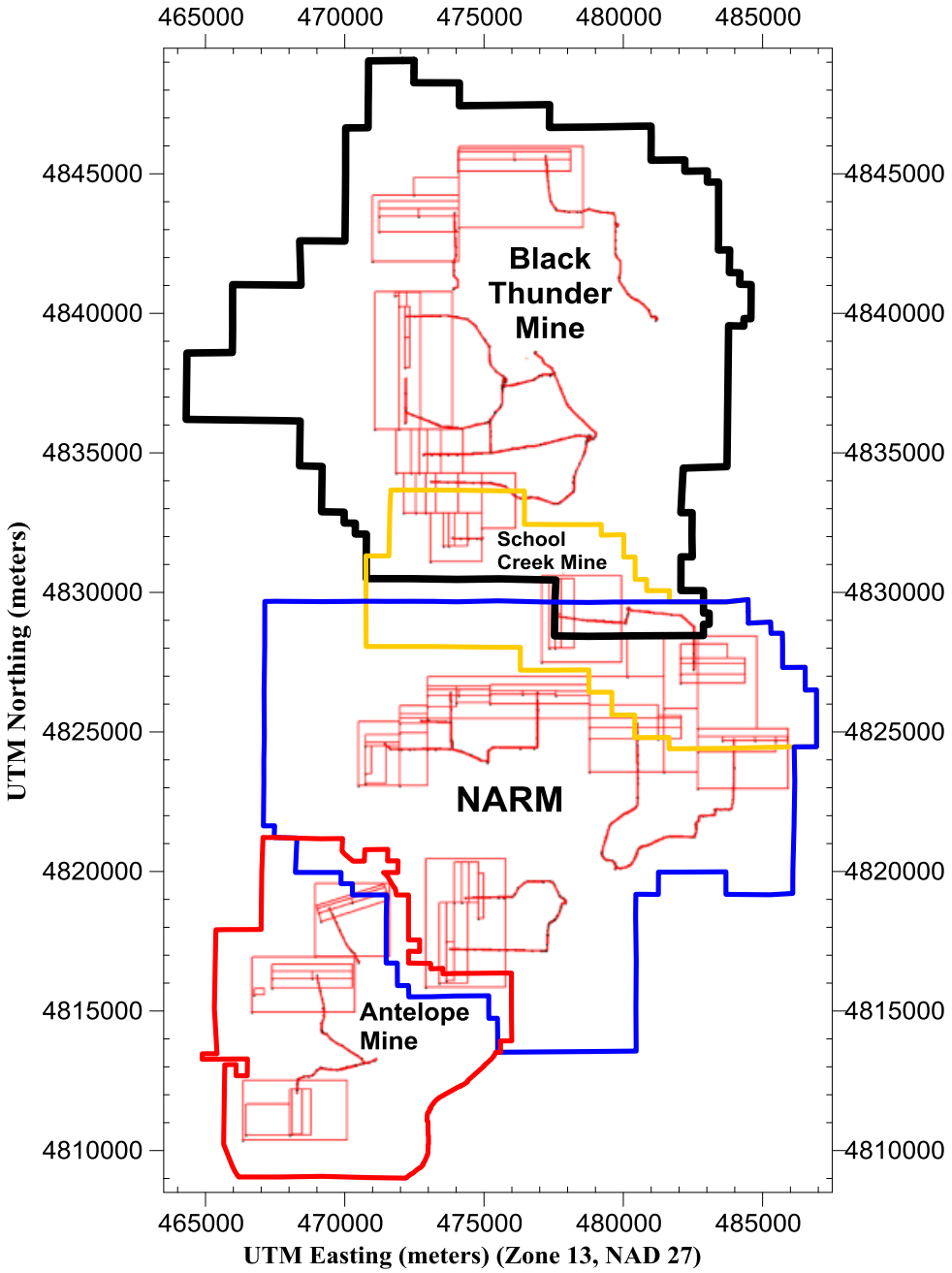
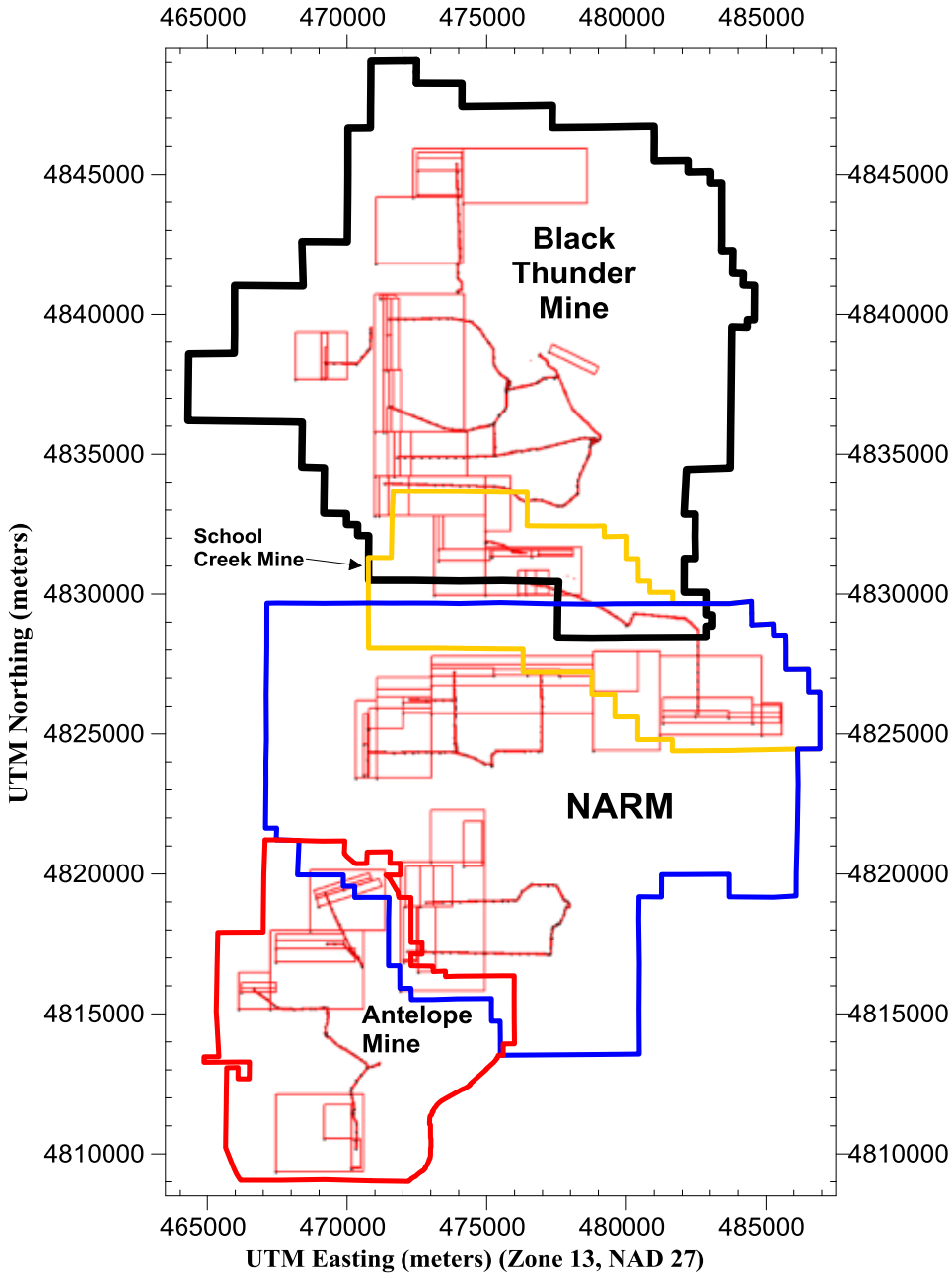


Figure 10-6: Fugitive PM_{10} Sources for 2023



10.3.3 PM_{10} Background Concentration

The Division requires that all mines in the PRB submit and justify an annual background PM_{10} concentration to represent all background sources that are not explicitly input to dispersion modeling analyses. The applicant determined that a background concentration of 11.2 µg/m^3 was appropriate for the mine, and the Division concurred.

10.3.4 PM_{10} Dispersion Modeling Results

To arrive at total predicted impacts for 2018 and 2023, the contributions from each mine were summed and the annual background level was added. The Division employed the "Mine A/Mine B" policy where appropriate for evaluating the final predicted ambient PM_{10} concentrations.

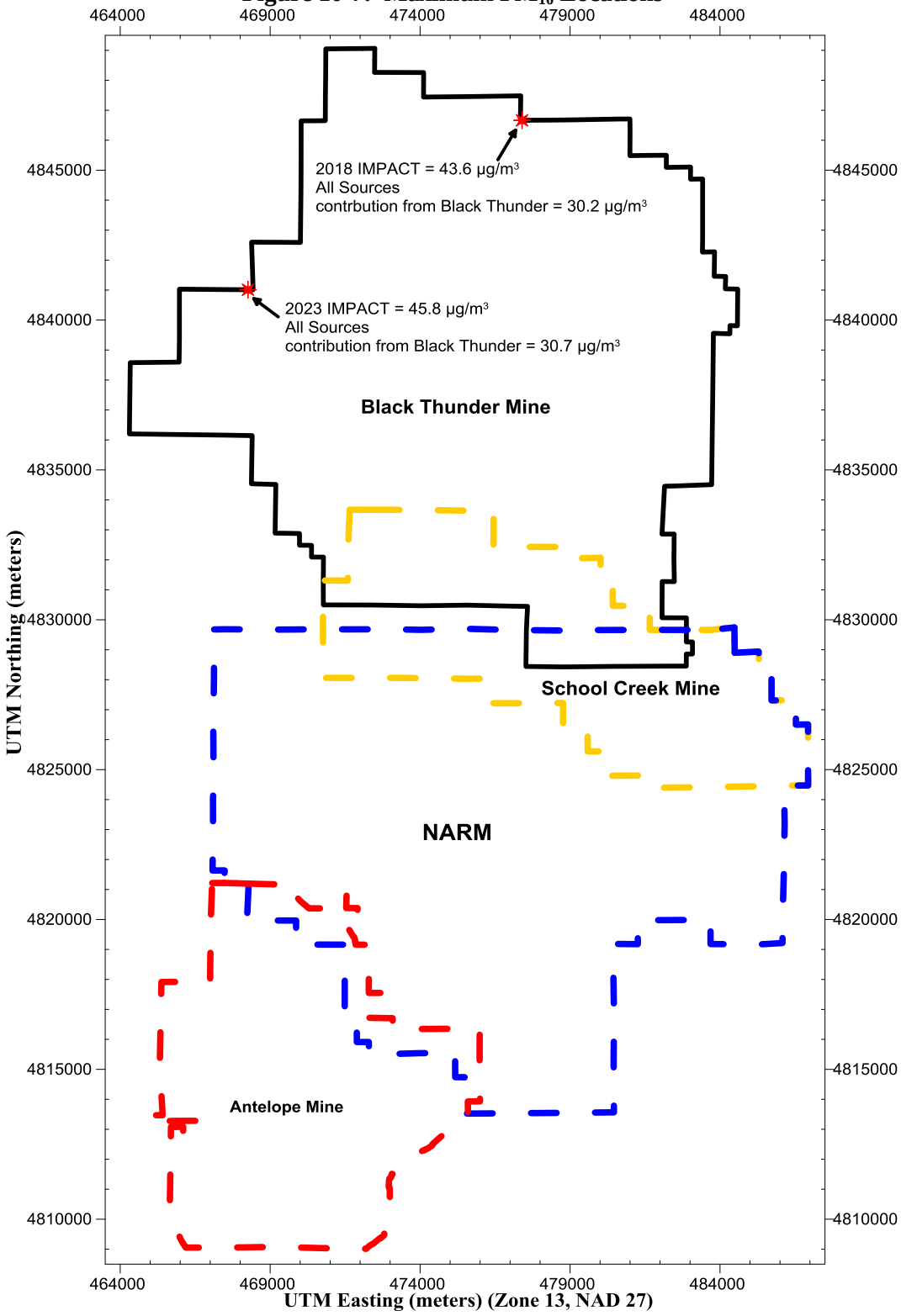
The maximum model-predicted PM_{10} concentration for 2018, including background, was 43.3 µg/m^3. This impact was predicted to occur along the northern LNCM of the Black Thunder Mine. For 2023, the maximum model-predicted concentration, with background, was 45.6 µg/m^3 and was predicted to occur along the western LNCM of the Black Thunder Mine. All modeled impacts were below the WAAQS. Results of the modeling are summarized in Table 10-6. Figure 10-7 shows the locations of the maximum predicted impacts.

Table 10-6: Summary of Modeled Annual PM_{10} Impacts

Year	UTM Location		Predicted PM_{10} Impact (µg/m^3)	Background Concentration (µg/m^3)	Total Predicted Impact (µg/m^3)	WAAQS (µg/m^3)
	X (m)	Y (m)				
2018	477399	4846663	32.4	11.2	43.6	50
2023	468261	4841011	34.6		45.8	

Note: UTM Coordinates are expressed in NAD 27, Zone 13.

Figure 10-7: Maximum PM_{10} Locations



10.4 ANALYSIS OF LONG-TERM NO_2 IMPACTS

For purposes of determining compliance with the Wyoming Ambient Air Quality Standard (WAAQS) for NO_2 of 100 µg/m^3 (annual average), the applicant submitted dispersion modeling analyses for NO_x sources at the Black Thunder Mine, along with neighboring mines and regional NO_x sources. The modeled NO_x concentrations were converted to nitrogen dioxide (NO_2) concentrations using EPA's default Ambient Ratio Method (ARM). EPA guidance, contained in the EPA's Guideline on Air Quality Models, allows the use of the national default ratio, which provides for a 25% reduction in modeled NO_x concentrations for purposes of estimating NO_2 concentrations.

10.4.1 NO_x Emission Inventories

Thunder Basin Coal Company, LLC modeled NO_x emissions from several types of sources at the Black Thunder Mine, including haul trucks, graders, scrapers, dozers, water trucks, and fugitive NO_x emissions from blasting. Additionally, NO_x emissions from locomotive sources operating within the Black Thunder Mine rail loops and the rail loops for the other mines in the South Group were included in the NO_x modeling analyses.

10.4.2 Tailpipe and Fugitive Sources

The main sources of gaseous emissions at the Black Thunder Mine are from tailpipes of the heavy-duty diesel powered mining equipment, railroad locomotives operating on the mine property, and detonation of explosives. A NO_x emissions inventory consisting of tailpipe and fugitive sources at the Black Thunder Mine was prepared based on operating statistics and mine plan for the two years chosen for modeling, 2018 and 2023.

Mobile source emissions from haul trucks, scrapers, graders, and dozers were calculated by the applicant using emission factors from the 4th edition of AP-42 Volume II, Mobile Sources (EPA, 1985) and operating statistics. Locomotive emissions were calculated using the EPA-recommended emission factor for line haul locomotives from Procedures for EI Preparation, Vol. IV: Mobile Sources, EPA-450/4-81-026d (EPA, 1992). The NO_x emission factor for blasting with ammonium nitrate and fuel oil (ANFO) was obtained from the 5th edition of AP-42, Section 13.3 (EPA, 1995).

NO_x emissions from all mining activities in the South Group of Mines were modeled as area or volume sources. Emission sources included 1) NO_x tailpipe emissions from mobile sources, such as haul trucks, graders, and dozers moving along the haul roads, 2) NO_x from fugitive sources emitting throughout the pit areas (modeled as pit area sources), and 3) locomotives operating within the mine loop (modeled as volume sources linked together).

NO_x emissions from mobile sources operating within the pit areas were assumed to occur in all active areas, and blasting emissions were assumed to occur only within the location of the pit for the current year.

A breakdown of the tailpipe, locomotive, and fugitive emissions in tons per year (tpy) that were included in the applicant's modeling analyses for the Black Thunder Mine are provided in Table 10-7. This data was tabulated for the two (2) worst-case years, and were calculated based on an operational schedule of 8,760 hours/year.

Table 10-7: Black Thunder Mine Annual NO_x Emissions Used in 2018 and 2023 Modeling Analyses		
Emission Source	**NO_x Emission Rate (tpy)**	
	2018	**2023**
Haul Trucks	2,927.5	3,523.8
Graders	65.1	78.4
Dozers	380.7	405.1
Scrapers	53.3	53.3
Loaders	86.3	93.4
Drills	60.3	60.2
Water Trucks	146.4	176.2
Pumps	102.2	102.23
Locomotives	767.2	725.0
Blasting	2,616.8	2,754.5
Welders	29.1	29.1
Light Plants & Generators	29.3	29.3
Totals	**7,264.2**	**8,030.5**

10.4.3 NO_x Emission from the South Group of Mines

The same source characterizations and emissions apportionment techniques that were used to model NO_x sources at the Black Thunder Mine were also used to model NO_x sources at the neighboring mines. A summary of the NO_x emissions inventory for all of the mines in the South Group that were represented in the model simulations for 2018 and 2023 are provided in Table 10-8 with relative locations for the 2018 and 2023 NO_x sources shown in Figures 10-8 and 10-9.

Table 10-8: South Group of Mines (PRB) NO_x Emissions used in WAAQS Modeling Analyses (tpy)					
Year	Black Thunder	NARM	Antelope	School Creek	Total
2018	7,264	3,965	2,012	1,111	14,352
2023	8,031	3,975	1,848	1,198	15,052

Figure 10-8: 2018 NO_x Sources

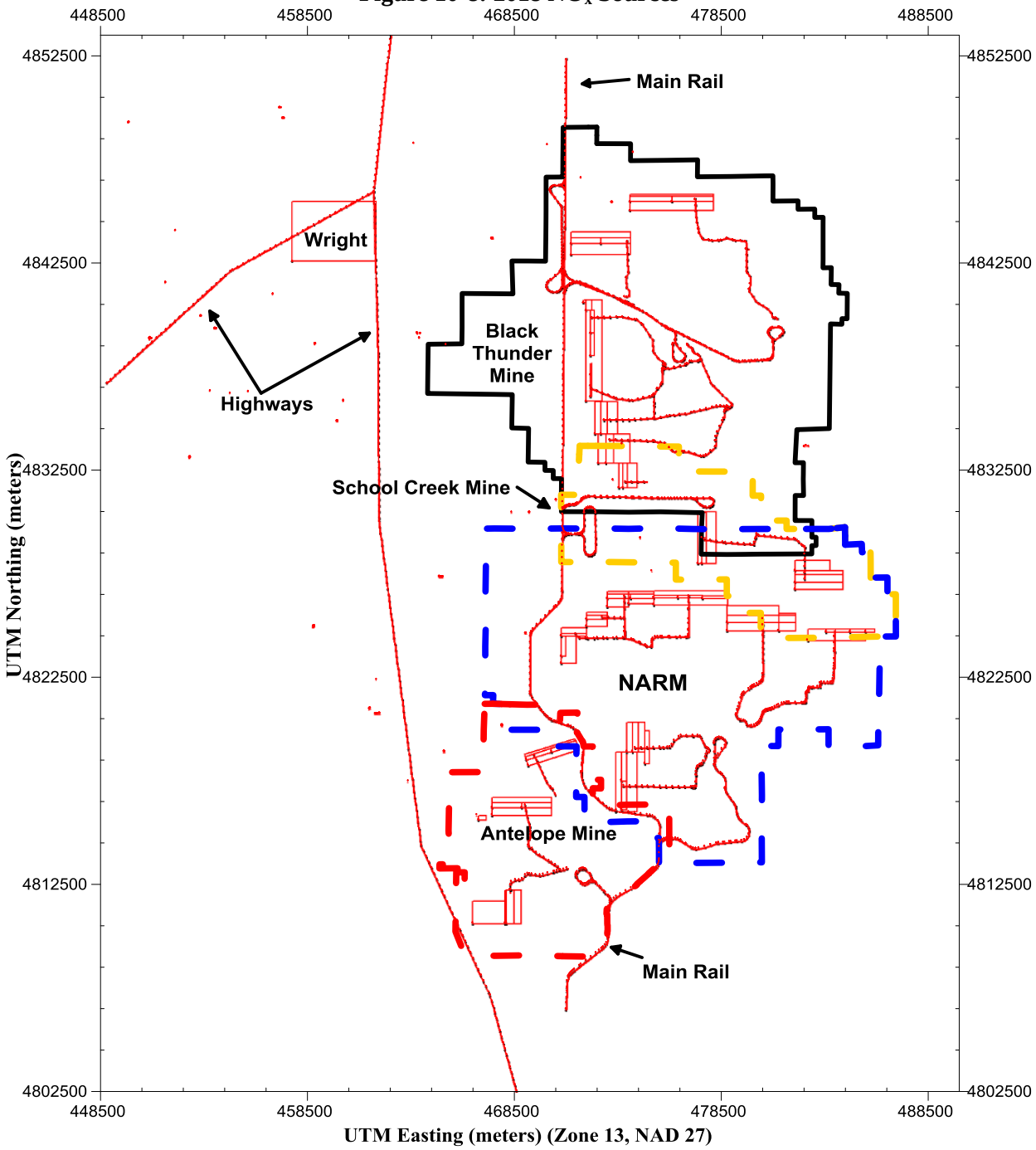
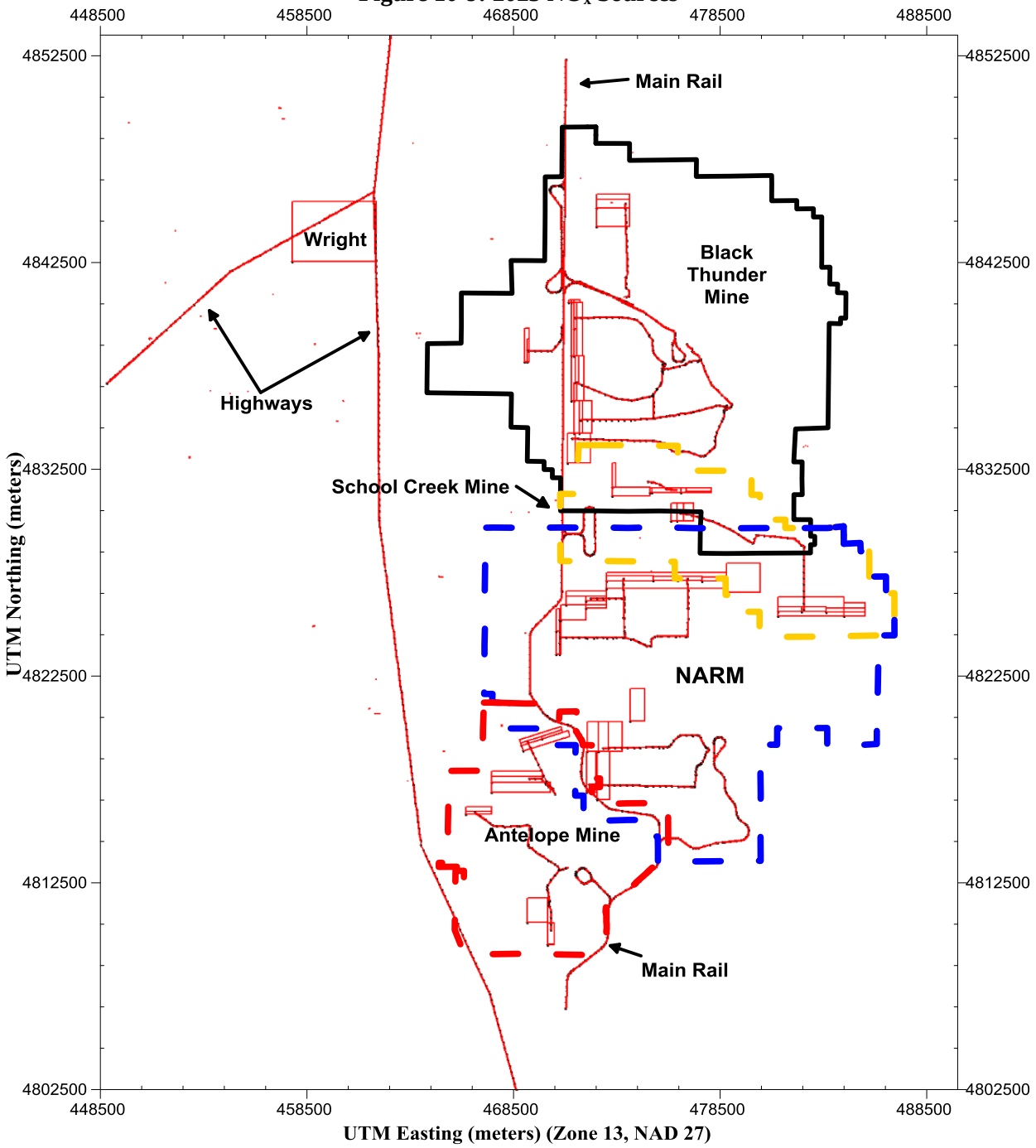


Figure 10-9: 2023 NO_x Sources



Fugitive and point source emissions for NARM were taken from the permit application for Permit MD-16282. Fugitive and point source emissions for the Antelope Mine were taken from the permit application for Permit MD-13361, and similar information for the School Creek Mine was obtained from the permit application for Permit MD-6445.

10.4.4 NO_x Emission Inventory Development for Regional Sources

The Division has specified three (3) large rectangular inventory areas for the North, Middle, and South Group of Mines to be used as a basis for defining and extracting a regional emissions inventory for each group of mines using the Northeast Wyoming Inventory database. Emission sources that are located within these rectangular search areas are included in the NO_x modeling analyses for each respective group of mines.

The Black Thunder Mine is located in the South Group inventory area. This particular inventory area is approximately forty (40) km (east-west) by forty-six (46) km (north-south), and includes the neighboring mines in the South Group: School Creek, NARM, and Antelope. The UTM Coordinates that define the boundaries of the South Group inventory area are provided below:

South Group Search Area
UTM Coordinates (Zone 13) NAD27

Easting (meters)	Northing (meters)
450,000	4,806,400
450,000	4,852,400
490,000	4,852,400
490,000	4,806,400

A regional NO_x emissions inventory was provided to the applicant by the Division, based on data contained in the Division's Northeast Wyoming Inventory Database; the subset of emissions corresponding to this particular inventory area consists of actual NO_x emissions for coal mines in the South Group, the north/south main line railroad, mobile (Highway 59 and other small road segments), the town of Wright, Wyoming, all power plants in Campbell County, as well as permitted NO_x emission rates for point sources throughout Northeast Wyoming, which include compressor stations supporting oil/gas and coal bed methane production.

The regional NO_x emission sources that were represented in the modeling analyses for 2018 and 2023 are shown in Table 10-9.

Table 10-9: Regional NO_x Emissions Summary (tpy)

Worst-Case Years	Mainline Rail	Point Sources	Highways	Urban	Total
2018/2023	1,946	13,398	108	21	24,165

10.4.5 NO_2 Background Concentration

A background NO_2 concentration of 13.2 $\mu g/m^3$ was taken from ambient monitoring conducted at the Belle Ayr Mine. The Division considers the Belle Ayr Mine NO_2 ambient data to be the best available estimate of background NO_2 concentration for the project area.

10.4.6 NO_x Dispersion Modeling Results

For each receptor used in the 2018 and 2023 WAAQS modeling analysis, the AQD determined the modeled concentration from each source group, including the contribution from each of the mines, power plants, other point sources, highways, urban areas, and mainline rail sources. The Division employed the "Mine A/Mine B" policy for evaluating ambient NO_x concentrations where appropriate. Raw model results for NO_x were multiplied by the *national default ratio* of 0.75 to account for partial chemical conversion to NO_2, and the background concentration of 13.2 $\mu g/m^3$ was added to the modeled concentrations.

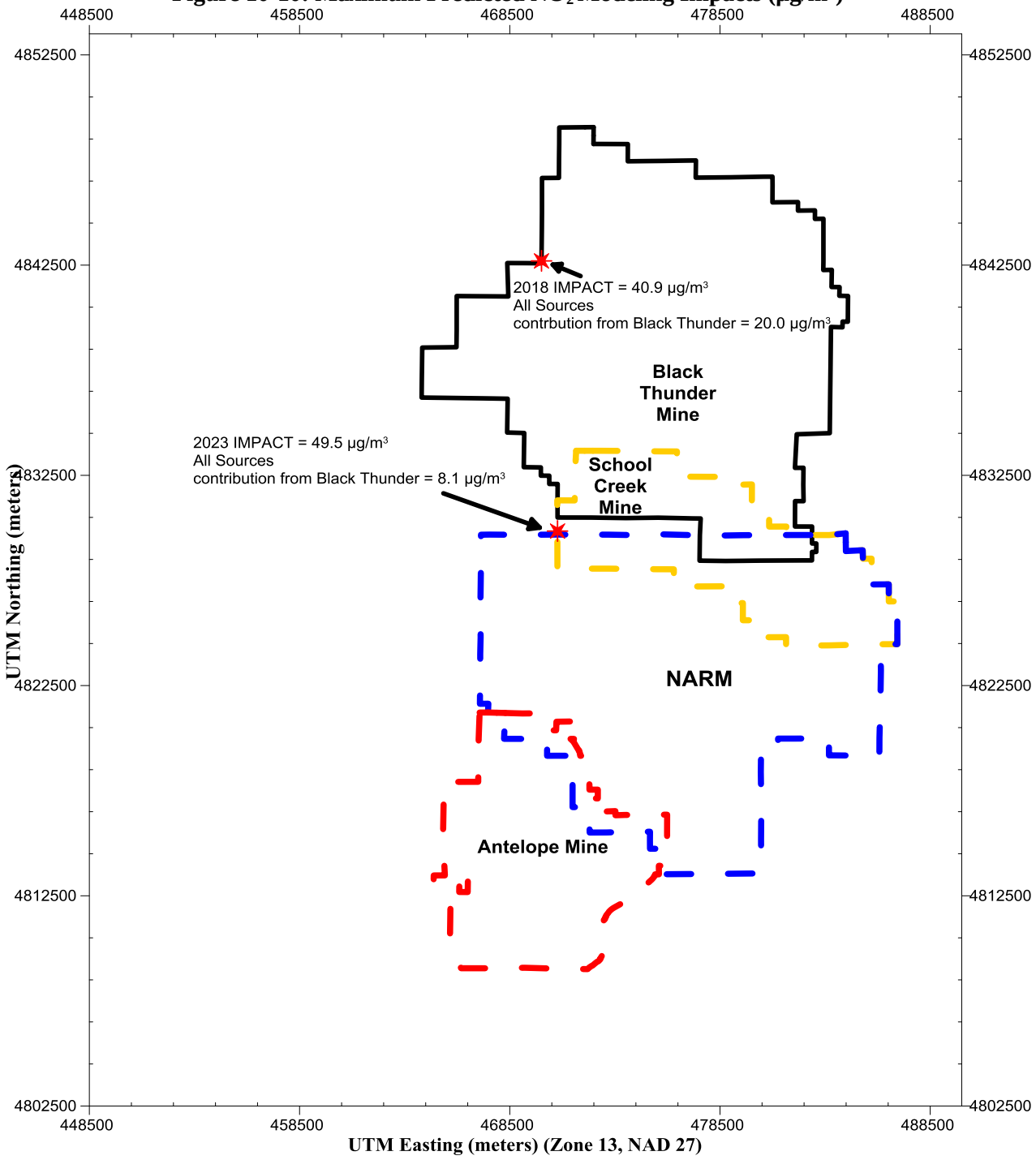
For the emission projection year 2018, the maximum model-predicted NO_x concentration was 40.9 $\mu g/m^3$ at a receptor on the northwest LNCM of Black Thunder Mine. For the emission projection year 2023, the maximum model-predicted NO_x concentration was 49.5 $\mu g/m^3$ at a receptor on the west portion of the School Creek Mine LNCM. Table 10-10 provides a summary of the modeling results, and Figure 10-10 shows the locations of the maximum predicted impacts.

Table 10-10: Summary of Modeled NO_2 Impacts

Year	UTM Location		Predicted NO_2 Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Predicted Impact ($\mu g/m^3$)	Wyoming Standard $\mu\mu g/m^3$)
	X (m)	Y (m)				
Maximum Predicted Impacts						
2018	470009	4842701	27.7	13.2	40.9	100
2023	470772	4830849	36.3		49.5	

Note: UTM Coordinates are expressed in NAD 27, Zone 13.

Figure 10-10: Maximum Predicted NO_2 Modeling Impacts (µg/m^3)



10.5 Ozone

Ozone is a pollutant that does not directly emerge from the stacks of air pollution sources, but forms due to "precursor" emissions [NO_x and volatile organic compounds (VOC)] from a number of sources over larger (regional) areas. Because of the uncertainty and expense associated with the models currently available to predict ozone formation, computer modeling to demonstrate compliance with the ozone NAAQS is not typically performed for single facilities, and was not performed for the Black Thunder Mine. To assess the potential impact of the proposed project on local ozone levels, ozone monitoring data was examined to determine the current ambient levels, and the expected emissions of ozone precursors from the proposed project were compared to county-wide levels of the same pollutants.

Ozone levels are measured at monitoring stations in the Thunder Basin National Grassland area, thirty (30) miles northeast of Gillette, Wyoming, and at the Division's Campbell County Monitor, fifteen (15) miles southwest of Gillette, Wyoming. Table 10-11 presents a summary of measured ozone values at these sites in eastern Wyoming.

Note that attainment of the 8-hour NAAQS for ozone is based on the 3-year average of the annual 4th highest daily maximum 8-hour concentrations.

Table 10-11: Monitored Concentrations of 8-Hour Ozone (O_3)

Monitor Location	Measured Concentration (ppb) [(1)]	NAAQS/WAAQS (ppb)
Thunder Basin National Grasslands Campbell County, WY	63	75
Campbell County Monitor Campbell County, WY	63	

[(1)] 3-year average of annual 4th highest (99th percentile) daily maximum 8-hour concentration (2012-14).

The Division also compared the expected emissions of ozone precursors from the Black Thunder Mine to the county-wide emissions for the two (2) counties that encompass the South Group of Mines, Campbell and Converse Counties. The maximum occurrence of NO_x and VOC emissions from the Black Thunder Mine, were calculated to occur in 2023 and total 8,031 tpy and 272 tpy, respectively. This equates to an estimated increase of 4,180 tpy of NO_x and 131 tpy of VOC from the reported emissions in the 2011 emission inventory. As shown in Table 10-12, the expected increase in emissions of ozone precursors from the Black Thunder Mine represent less than 8% of the two-county total of the precursors that existed in 2011.

Table 10-12: Countywide Emissions of Ozone Precursors vs. Potential Emissions from Black Thunder Mine

Category	NO_x (tpy)	VOC (tpy)
Projected Increase at the Black Thunder Mine	4,180	131
Campbell County Total*	36,214.50	1,605.30
Converse County Total**	9,876.90	7,457.60
% of County-Wide Total (from Black Thunder Mine increases)	9.1%	1.4%

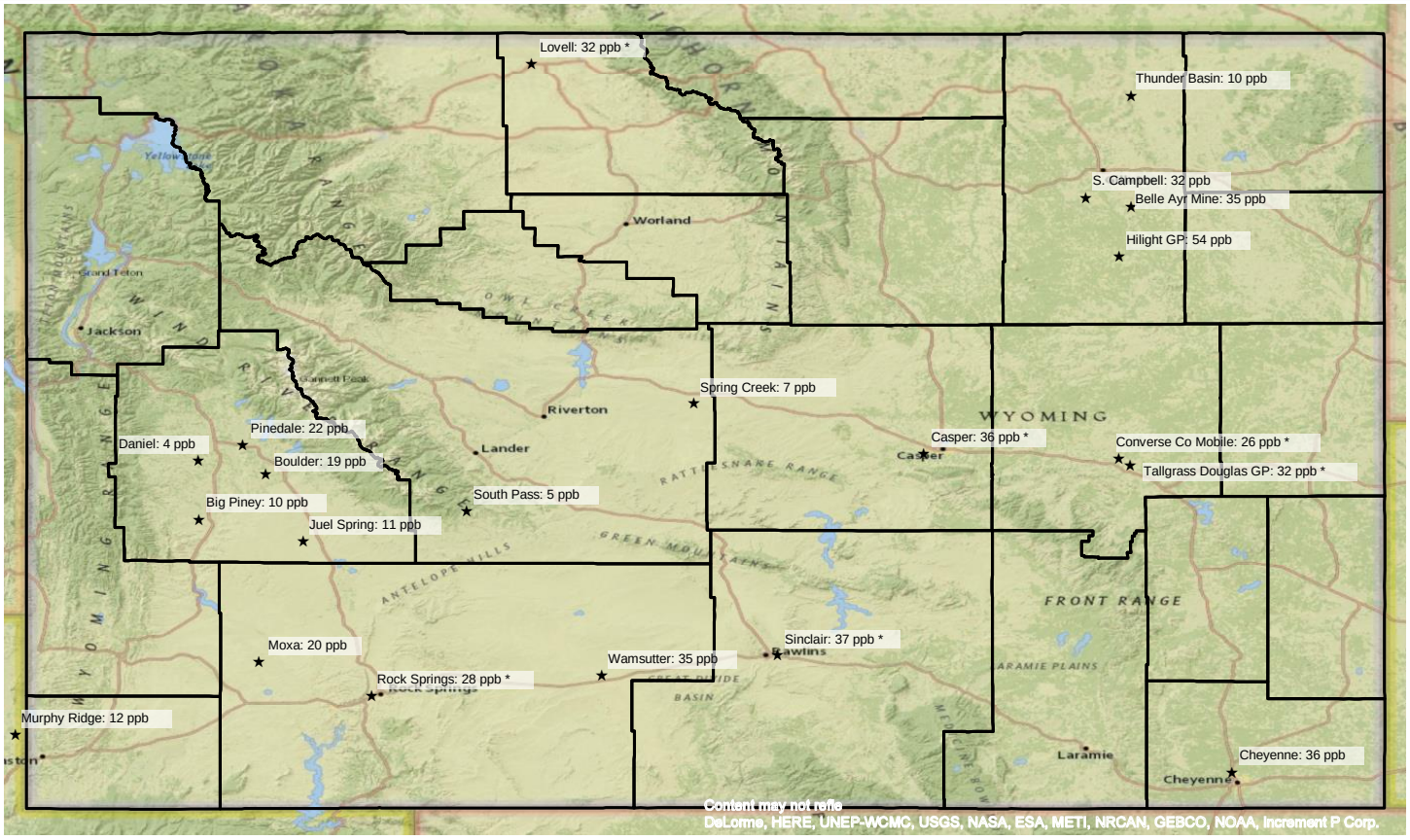
* Source: 2011 emissions inventory for Title V and minor sources.
** Source: 2011 emissions from point sources and from oil and gas production sites.

Multiplying the average monitored concentration of 63 ppb by 1.078, to reflect the influence of Black Thunder Mine's increases to these ozone precursors, a conservative estimate was determined, 67.9 ppb, which is well below the 75 ppb NAAQS/WAAQS.

10.6 ANALYSIS OF 1-HOUR NO_2 IMPACTS

Statewide monitoring of NO_2 on the basis of a 1-hour averaging period indicates that the 1-hour NAAQS of 100 ppb is not threatened at any of twenty-one (21) monitoring sites through 2014 (see Figure 10-11 below). Several of the Wyoming monitors are located in areas of concentrated industrial development. One (1) of the monitors is located at the Belle Ayr Mine, near rail activities, to capture "maximum concentrations" in the Powder River Basin. Based on the current statewide 1-hour NO_2 monitoring and the NO_x emissions total from the Black Thunder Mine, the Division is satisfied that the operation of the Black Thunder Mine will not prevent the attainment or maintenance of the 1-hour NAAQS for NO_2.

Figure 10-11: Monitoring for 1-Hour NO_2 in Wyoming (ppb)



Note: To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour averages must not exceed 100 ppb. Concentrations shown in the figure above from Wyoming monitoring stations are 3-year (2012-2014) averages of the 98th percentile of the daily maximum 1-hour averages. If three years of data were not available for a particular station, the 98th percentile of the daily maximum 1-hour averages over the period of available data is shown.

* Less than three (3) years of complete data reported.

11.0 CONCLUSIONS AND PROPOSED PERMIT CONDITIONS

With continued emphasis on application of BACT and BMP work practices, and on continued operation of an approved ambient monitoring network, the Division is satisfied that the proposed mine plan changes at the Black Thunder Mine can be implemented while maintaining ambient air quality standards.

Specifically, the applicant's dispersion modeling analyses were conducted using U.S. EPA approved models and methodologies, and the Division has reviewed and verified the source parameters, default settings, and related modeling inputs used in the applicant's modeling analyses. Through the required dispersion modeling analyses and other ambient impact analyses, the applicant has successfully demonstrated to the Division that all applicable air quality standards will be attained if the proposed changes in the applicant's mine plan and mining operations are approved. Therefore, the Division is proposing to issue a modification permit to Thunder Basin Coal Company, LLC for the Black Thunder Mine with the following conditions:

1. That authorized representatives of the Division of Air Quality be given permission to enter and inspect any property, premise or place on or at which an air pollution source is located or is being constructed or installed for the purpose of investigating actual or potential sources of air pollution and for determining compliance of non-compliance with any rules, standards, permits or orders.

2. That all substantive commitments and descriptions set forth in the application for this permit, unless superseded by a specific condition of this permit, are incorporated herein by this reference and are enforceable as conditions of this permit.

3. That a permit to operate, in accordance with Chapter 6, Section 2(a)(iii) of the WAQSR, is required after a 120-day startup period in order to operate this facility.

4. That all notifications, reports and correspondences associated with this permit shall be submitted to the Stationary Source Compliance Program Manager, Air Quality Division, 122 West 25th Street, Cheyenne, WY 82002 and a copy shall be submitted to the District Engineer, Air Quality Division, 2100 West 5th Street, Sheridan, WY 82801. Submissions may also be done electronically through https://airimpact.wyo.gov to satisfy requirements of this permit waiver.

5. That written notification of the anticipated date of initial startup of the change in coal removal progression, in accordance with Chapter 6, Section 2(i) of the WAQSR, is required not more than sixty (60) days or less than thirty (30) days prior to such date. Notification of the actual date of startup is required within fifteen (15) days after startup.

6. That the date of commencement of construction of the West Hilight Truck Dump and associated coal processing equipment shall be reported to the Administrator within thirty (30) days of commencement. In accordance with Chapter 6, Section 2(h) of the WAQSR, approval to construct or modify shall become invalid if construction is not commenced within twenty-four (24) months after receipt of such approval or if construction is discontinued for a period of twenty-four (24) months or more. The Administrator may extend the period based on satisfactory justification of the requested extension.

7. That a minimum of one hundred twenty (120) days prior to starting construction of the West Hilight Truck Dump and associated coal processing equipment, Thunder Basin Coal Company, LLC shall submit plans detailing construction designs to the Division. These plans should include schematics and basic engineering design and shall show the exact location of the facilities to be constructed. Plans shall include the stilling shed design and the number and location of the atomizer/fogger systems.

8. That performance tests be conducted, in accordance with Chapter 6, Section 2(j) of the WAQSR, within thirty (30) days of achieving a maximum design rate but not later than ninety (90) days following initial startup of the West Hilight Truck Dump and associated coal processing equipment, and a written report of the results be submitted. The operator shall provide fifteen (15) days prior notice of the test date. If a maximum design rate is not achieved within ninety (90) days of startup, the Administrator may require testing be done at the rate achieved and again when a maximum rate is achieved.

9. Initial performance testing, as required by Condition 8 of this permit, shall be conducted on the following sources:

    i. West Hilight Truck Dump and atomizer/fogger systems associated with the overland conveyor system:

        Opacity: Performance testing shall follow the requirements of Chapter 5, Section 2(i) of the WAQSR.

    Results shall be submitted to the Division within forty-five (45) days of completion.

10. That the following requirements shall be met for all atomizer/fogger systems at the Black Thunder Mine:

    a. The atomizer/fogger systems shall be operated and maintained so the system enclosure exhibits no visible emissions as determined by Method 22 of appendix A, 40 CFR part 60.

    b. That the atomizer/fogger systems and associated monitoring equipment shall be operated during all times that the respective coal preparation facilities are in operation.

    c. Thunder Basin Coal Company, LLC shall conduct, at minimum, daily visual observations of the atomizer/fogger systems to determine the presence of visible emissions on any day the respective coal preparation facilities are in operation. Records shall be kept documenting whether visual emissions are noted and the corrective action taken. These records shall be maintained for a period of five (5) years and shall be made available to the Division upon request.

    d. Thunder Basin Coal Company, LLC may utilize 40 CFR §60.255(f) of Subpart Y in lieu of utilizing (b) of this condition to demonstrate continuous compliance with (a) of this condition.

11. That the following sources shall be controlled with atomizer/fogger systems:

Source Description	
Black Thunder	**East Black Thunder**
Primary Crusher	East Circuit #4 ROM Conveyor
Secondary Crusher	East Circuit #4 Overland Conveyor
Belt 2902 Transfer	East Circuit #4 Surge Bin
Belt 2903 Transfer	East Circuit #1 South Transfer
North Silo Headhouse	East Circuit #2 North Transfer
Belt 2901 Transfer	East Circuit #2 Storage Conveyor
Belt 612 Transfer	East Circuit #1 Storage Conveyor
Belt 626 Transfer	East Circuit #3 Storage Conveyor
Belt 609 Transfer	East #5 Belt
Near Pit Crusher #1	East #6 Belt
Near Pit Crusher #2	East #8 Belt
Near Pit Overland Conveyor Transfer	East #A4 Belt
5-West Crusher	East #9 Belt
West Black Thunder	East #A2 Belt
West Crusher	
West Overland Conveyor Transfer	
West Hilight Black Thunder	
West Hilight Crusher	
West Hilight Overland Conveyor Transfer	

12. That Thunder Basin Coal Company, LLC shall comply with the applicable requirements of 40 CFR part 60, subpart Y.

13. That Thunder Basin Coal Company, LLC shall conduct the following for the coal truck dumps at the Black Thunder Mine, except for the West Hilight Truck Dump:

    i. Thunder Basin Coal Company, LLC shall conduct, at minimum, a control effectiveness demonstration on each truck dump control system each calendar quarter. Control effectiveness for each truck dump control system shall be determined by using the methodology in 40 CFR §60.255(h)(1)(i) and (ii). The Division shall consider the threshold defining relative control effectiveness to be no greater than twenty percent (20%) opacity for each truck dump. Observations shall be conducted by an observer certified in accordance with Section 3.1 of Method 9.

ii. A control effectiveness demonstration with an opacity of 20 percent or greater shall prompt immediate inspection and, if necessary, corrective action. Corrective action must be initiated when the control device is determined to be improperly maintained or operated as determined by inspection. Thunder Basin Coal Company, LLC shall document any inspection of the truck dump control system(s) and any corrective actions taken. The duration of any corrective action taken to resolve any items found during an inspection shall be noted along with any justification for delays. Upon completion of the corrective action at the truck dump, Thunder Basin Coal Company, LLC shall conduct a demonstration of the control effectiveness of the truck dump control system, as described in (i) of this condition.

14. That the coal truck dumps (except for the West Hilight Truck Dump) shall be limited to less than 20 percent (20%) opacity, per the requirements of Subpart Y. Compliance with the 20 percent opacity limit at the coal truck dumps will be determined by Method 9 of appendix A, 40 CFR part 60.

15. That Thunder Basin Coal Company, LLC shall conduct an annual Method 9 observation (one 6-minute average) of each coal truck dump (except for the West Hilight Truck Dump) to measure the opacity of any fugitive emissions. The Method 9 observations shall be conducted by an observer certified in accordance with Section 3.1 of Method 9 and shall follow the requirements and procedures of Method 9 as contained in 40 CFR part 60, appendix A.

16. That the West Hilight Truck Dump shall be limited to less than ten percent (10%) opacity, per the requirements of Subpart Y of 40 CFR part 60.

17. That Thunder Basin Coal Company, LLC shall conduct the following for the West Hilight Truck Dump at the Black Thunder Mine:

i. Compliance with the opacity limit in Condition 16 at the West Hilight Truck Dump shall be determined, at minimum, at least once each calendar quarter using the methodology in 40 CFR §60.255(h)(1)(i) and (ii). Observations shall be conducted by an observer certified in accordance with Section 3.1 of Method 9.

ii. An opacity of ten percent (10%) or greater shall prompt immediate inspection and, if necessary, corrective action. Corrective action must be initiated when the control device is determined to be improperly maintained or operated as determined by inspection. Thunder Basin Coal Company, LLC shall document any inspection of the West Hilight Truck Dump control system and any corrective actions taken. The duration of any corrective action taken to resolve any items found during an inspection shall be noted along with any justification for delays. Upon completion of the corrective action at the West Hilight Truck Dump, Thunder Basin Coal Company, LLC shall conduct an opacity observation of the West Hilight Truck Dump control system, as described in (i) of this condition.

18. That Thunder Basin Coal Company, LLC shall conduct, at minimum, weekly inspections of the truck dump control systems installed at each coal truck dump to determine any repair measures necessary to minimize fugitive dust emissions and maintain proper operation of the control system. Corrective action and repair measures must be initiated in an expeditious manner when the control device is determined to be improperly maintained or operated.

19. The coal truck dump pads shall be cleaned, treated, and maintained to minimize the coal fines that accumulate due to spillage from the trucks. Cleaning practices or treatment of the road surfaces shall be maintained on a continuous basis to the extent that cleaning or the surface treatment remains a viable control measure that will be adequate to control fugitive dust emissions.

20. That all permanent haul roads shall be treated with a chemical dust suppressant in addition to water to control fugitive dust emissions, and shall be maintained continuously to the extent that such treatment remains a viable control measure.

21. That all temporary haul routes, including pit floor haul routes, shall be treated with water and/or chemical dust suppressants to control fugitive dust emissions, on a schedule such that treatment remains a viable control measure.

22. That Thunder Basin Coal Company, LLC shall submit to the Division by April 1st of each year, a report addressing road dust control measures employed during the past year and a disturbed acreage report for the year. This plan shall include the following:

    a. A map based on the past year end conditions with the following information:
        - All roads existing at the end of the calendar year, which have been treated with water and/or dust suppressant.
        - Locations of active operations, treated disturbed areas, and reclaimed areas.
    b. Type and annual quantity of dust suppressants used for the past year and a description of the general application procedures and schedule.
    c. Number of water trucks, capacities of each water truck, and quantity of water used for the past year.
    d. Operating hours by water truck and total water truck fleet hours for the past year.
    e. Total length in miles of permanent and temporary haul roads existing at the end of the calendar year, which have been treated with water and/or dust suppressant.
    f. Overburden and coal production rates for the past year.
    g. A table summarizing the acreages and control measures or BMP uses/applied by active operations, treated disturbed areas, and reclaimed areas.

23a. Topsoiled areas greater than 150 contiguous acres that will not be revegetated within 60 days of completion of topsoil laydown and regraded backfill areas greater than 150 contiguous acres that will not be topsoiled within 60 days, shall be ripped or chiseled to create a roughened surface, seeded with a temporary vegetative cover, or otherwise effectively stabilized against wind erosion.

23b. Topsoiled areas less than 150 contiguous acres that will not be immediately revegetated and regraded backfill areas less than 150 contiguous acres that will not be topsoiled for an extended period of time, shall be ripped or chiseled to create a roughened surface, seeded with a temporary vegetative cover, or otherwise effectively stabilized against wind erosion as soon as feasible.

24. That Thunder Basin Coal Company, LLC shall utilize a program to mitigate coal fires that result from spontaneous combustion. Attempts to extinguish coal fires must be initiated within twenty-four (24) hours of discovering the fire and pursued until the fire is extinguished, unless operational safety issues are present. For all coal fires where efforts to extinguish the fire were not initiated within twenty-four (24) hours, or for fires which were not extinguished within twenty-four (24) hours of the initial attempt to extinguish the fire, Thunder Basin Coal Company, LLC shall document the measures taken to extinguish the fire and the reasons for any delays.

25. That Thunder Basin Coal Company, LLC shall operate, in accordance with the requirements of 40 CFR parts 50 and 58 an approved ambient monitoring program that includes an ambient PM_{10} monitoring network at the Black Thunder Mine to demonstrate compliance with the ambient PM_{10} standards in Chapter 2, Section 2 of the WAQSR. Thunder Basin Coal Company, LLC shall maintain a quality assurance plan for the monitoring network, as required by 40 CFR part 58 and shall be approved by the Division.

26. Thunder Basin Coal Company, LLC shall comply with all commitments made in the quality assurance plan for the ambient PM_{10} monitoring network in Condition 25 for the Black Thunder Mine, and the data generated by the ambient NO_2 and PM_{10} monitoring network shall be submitted in a Division approved format on a quarterly basis, within 60 days following the end of the quarter.

27. Thunder Basin Coal Company, LLC shall not emit pollutants in a manner that would cause any monitor in the ambient monitoring network described in Condition 25 to exceed the ambient air quality standards, in accordance with 40 CFR Part 50 and as described in Chapter 2 of the WAQSR.

28. Thunder Basin Coal Company, LLC shall notify the Division within 15 days of a monitored exceedance at any of the continuous monitors, and within 30 days of a monitored exceedance at any filter based monitor in the ambient PM_{10} monitoring network at the Black Thunder Mine.

29. That annually, Thunder Basin Coal Company, LLC shall submit to the Division, a demonstration that the ambient PM_{10} monitoring network is sufficient for monitoring impacts and demonstrating compliance with the ambient particulate standards in Chapter 2, Section 2 of the WAQSR from current as well as future (5-year projection) mining activities. This demonstration shall consist of a discussion of the ambient monitoring network along with an annual windrose, and current UTM coordinate locations of the monitors. In addition, a map showing current monitor locations in relation to active mining areas along with projected mining areas shall be included. The ambient monitoring network demonstration shall be submitted along with the annual report required for dust control measures in Condition 22, and a copy shall be submitted to the Air Quality Monitoring Program located in Cheyenne. The Administrator may require Thunder Basin Coal Company, LLC to modify their ambient monitoring network, including monitor locations, based on a review of the demonstration.

30. That Thunder Basin Coal Company, LLC shall adhere to their contingency action plan for high particulate events at the Black Thunder Mine. A copy of this plan titled *Dispatch Air Quality Event Action Plan* is attached in Appendix A. The contingency action plan for high ambient particulate impacts may be revised without administratively amending the permit, but revisions shall be approved by the Division prior to implementation.

31. That Thunder Basin Coal Company, LLC shall submit, if required by the Administrator, a demonstration that their *Dispatch Air Quality Event Action Plan* will adequately minimize high ambient particulate impacts. The Administrator may require Thunder Basin Coal Company, LLC to propose modification to their *Dispatch Air Quality Event Action Plan* based on the action plan demonstration.

32. That Thunder Basin Coal Company, LLC shall document the measures taken when an action level is triggered in their *Dispatch Air Quality Event Action Plan* in Condition 30.

33. That Thunder Basin Coal Company, LLC shall maintain a meteorological station at the Black Thunder Mine acceptable to the Division. Surface air meteorological data measurements shall be collected at the Black Thunder Mine, as specified in the EPA document: Meteorological Monitoring Guidance for Regulatory Modeling Applications. The meteorological data measurements shall consist of hourly observations of:

    a. Wind speed using an anemometer height of 10 meters
    b. Wind direction
    c. Ambient temperature

34. The meteorological data specified in Condition 33 shall be submitted in an electronic format on a quarterly basis.

35. That Thunder Basin Coal Company, LLC will limit public access to the lands defined by the Administrator as necessary to conduct mining operations. Limiting public access will include posting of fences with signs posted at one quarter mile intervals identifying the enclosed area and prohibiting access, locked gates and security at all mine entrances. The signs will identify the mine operator and inform the public of the restricted area. The Administrator has determined that the Lands Necessary to Conduct Mining boundary is described on a map titled *Proposed Black Thunder Mine Pit Progression and LNCM Boundary,* which is shown in Figure 3-1.

36. The maximum coal production by year at the Black Thunder Mine shall not exceed a production rate of 190 million tons per year. Mining may continue through the year 2031 as described in the mine plan contained in the application for this permit.

37. Thunder Basin Coal Company, LLC shall retain, at the Black Thunder Mine, records of the daily inspections, monthly observations, PM records, Method 22 observations, and support information as required by this permit for a period of at least five (5) years from the date such records are generated and the records shall be made available to the Division upon request.

38. That this permit shall supersede all previous Chapter 6, Section 2 permits and waivers issued for the Black Thunder Mine except for permit MD-14786. All conditions of MD-14786 shall remain in effect unless superseded by a specific condition of this permit.

Appendix A

Dispatch Air Quality Event Action Plan

Dispatch Air Quality Event Action Plan
Black Thunder Mine

The Action Levels are programmed automatically into the system. The mine dispatcher monitors the system when the mine is in operation. The system will pop-up an alert when one of the Action Levels has been triggered on any of the continuous Dust Monitors.

Action Levels (short-term 1 hour average)
300 ug/m3 level – notify Production Supervisor

- Supervisor Actions:
    - Notify Production Superintendent
    - Ensure adequate water trucks operating
    - Ensure problem areas are addressed
    - Record water usage and activities for the shift*

Action Levels (Average from Midnight**)
150 ug/m3 level – notify Production Supervisor

- Supervisor Actions:
    - Upon notification, the operations supervisor will consider relevant information, which can include time of day, wind speed, wind direction, and/or the near-term forecast for precipitation and wind activity
    - Notify Production Superintendent, who will notify the Mine Manager if it appears an excursion of the full-day 24-hour average of 150 ug/m3 may occur.
    - Determine areas of mining activity that are generating visible dust
    - Direct water trucks to those areas where access is feasible
    - Prioritize efforts at locations nearest to the mine boundary
    - Ensure adequate water trucks are operating
    - Ensure problem areas are addressed
    - Note any offsite or non-mine activities that may be contributing
    - Inspect topsoil removal and reclamation contractors to ensure proper dust control
    - If it is precipitating in the field, notify dispatch of conditions and continue to monitor levels and field conditions. (The monitor may read false highs until precipitation conditions change.)
    - In areas where water truck access is not feasible, relocate, modify or shut down mining activities contributing dust in the area nearest the triggered monitor if necessary to stabilize dust concentrations. The immediate focus should be on those activities that generate fine soil particles. These activities include:
        - Spoil ripping
        - Topsoil chiseling
        - Topsoil laydown
        - Road maintenance/grading
        - Haul truck traffic
        - Truck dumping of waste coal
        - Truck dumping of product coal
        - Truck dumps of overburden and/or topsoil
    - The secondary focus should be on those activities that generate large soil particles. These activities include:
        - Spoil dozing
        - Dragline operations in the south pit if the spoil peaks are insufficient to contain the dust
        - Other dragline operations
        - If feasible, modify dragline operations to dump the spoils as low as possible in high wind conditions.

Notes:
*TBCC maintains records of water truck hours that are used to generally describe mitigation activities when recorded dust levels are high. These records combined with precipitation information provide an appropriate overview of response activities.

** The 24-hour average from midnight only includes hourly averages from midnight the previous night. It is not a 24-hour rolling average that is utilized by other mines for their action levels; therefore, comparison of action levels between mines is not appropriate. It is possible that the 24-hour average from midnight could contain data from only a few hours in the morning and show average levels over 150 ug/m3 that will lower throughout the day and will not result in an elevated level at the end of the day. This is why it is important for the supervisor to consider time of day when alert levels are triggered.

*** The plan is utilized in addition to normal watering and dust control practices.

Appendix B

PM_{10} Emission Inventory
Model Year 2018

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory
Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: Black Thunder
Inventory Year: 2018
Coal Production (MMTPY): 190
Basis: A0000611
Date: June 15, 2015
Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	27768	
PM-10 Emissions (tpy)	**48.38**	
PM-10 Emissions (g/s)	**1.39**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	476.273	MMbcy
PM-10 Emissions (tpy)	**1864.6**	
PM-10 Emissions (g/s)	**53.64**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	270.501	MMbcy
PM-10 Emissions (tpy)	**1217.3**	
PM-10 Emissions (g/s)	**35.02**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	190	MMtpy
PM-10 Emissions (tpy)	**59.85**	
PM-10 Emissions (g/s)	**1.72**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	190	MMtpy
PM-10 Emissions (tpy)	**54.51**	
PM-10 Emissions (g/s)	**1.57**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	11125	acres
Treated Disturbed Area	0	acres
PM-10 Emissions (tpy)	**834.38**	
PM-10 Emissions (g/s)	**24.00**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	476.273	MMbcy
Vehicle Miles Traveled	8207896	VMT
Annual Haul Distance	2.38	miles
PM-10 Emissions (tpy)	**965.14**	
PM-10 Emissions (g/s)	**27.76**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine:	Black Thunder	Basis:	A0000611
Inventory Year:	2018	Date:	June 15, 2015
Coal Production (MMTPY):	190	Engineer:	Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	190	MMtpy
Vehicle Miles Traveled	4715616	VMT
Annual Haul Distance	5.96	miles
PM-10 Emissions (tpy)	**985.77**	
PM-10 Emissions (g/s)	**28.36**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	182707	
PM-10 Emissions (tpy)	**318.36**	
PM-10 Emissions (g/s)	**9.16**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	1357	
PM-10 Emissions (tpy)	**5.34**	
PM-10 Emissions (g/s)	**0.15**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	1488	
PM-10 Emissions (tpy)	**8.37**	
PM-10 Emissions (g/s)	**0.24**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	702719	VMT
PM-10 Emissions (tpy)	**45.68**	
PM-10 Emissions (g/s)	**1.31**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	444541	
PM-10 Emissions (tpy)	**121.48**	
PM-10 Emissions (g/s)	**3.49**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	59500	
PM-10 Emissions (tpy)	**286.36**	
PM-10 Emissions (g/s)	**8.24**	

TOTAL

Total PM-10 Emissions (tpy)	**6815.48**
Total PM-10 Emissions (g/s)	**187.82**

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: School Creek | Basis: CT-6445

Inventory Year: 2018 | Date: June 15, 2015

Coal Production (MMTPY): 40 | Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	9229	
PM-10 Emissions (tpy)	**16.08**	
PM-10 Emissions (g/s)	**0.46**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	50.2283	MMbcy
PM-10 Emissions (tpy)	**196.6**	
PM-10 Emissions (g/s)	**5.66**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	40.9583	MMbcy
PM-10 Emissions (tpy)	**184.3**	
PM-10 Emissions (g/s)	**5.30**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	40	MMtpy
PM-10 Emissions (tpy)	**12.60**	
PM-10 Emissions (g/s)	**0.36**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	40	MMtpy
PM-10 Emissions (tpy)	**11.48**	
PM-10 Emissions (g/s)	**0.33**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	4170	acres
Treated Disturbed Area	1787	acres
PM-10 Emissions (tpy)	**339.56**	
PM-10 Emissions (g/s)	**9.77**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	50.2283	MMbcy
Vehicle Miles Traveled	272747	VMT
Annual Haul Distance	0.75	miles
PM-10 Emissions (tpy)	**32.07**	
PM-10 Emissions (g/s)	**0.92**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory
Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine:	School Creek	Basis:	CT-6445
Inventory Year:	2018	Date:	June 15, 2015
Coal Production (MMTPY):	40	Engineer:	Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	40	MMtpy
Vehicle Miles Traveled	627914	VMT
Annual Haul Distance	3.77	miles
PM-10 Emissions (tpy)	**131.26**	
PM-10 Emissions (g/s)	**3.78**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	26033	
PM-10 Emissions (tpy)	**45.36**	
PM-10 Emissions (g/s)	**1.30**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	267	
PM-10 Emissions (tpy)	**1.05**	
PM-10 Emissions (g/s)	**0.03**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	359	
PM-10 Emissions (tpy)	**2.02**	
PM-10 Emissions (g/s)	**0.06**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	57425	VMT
PM-10 Emissions (tpy)	**3.73**	
PM-10 Emissions (g/s)	**0.11**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	57240	
PM-10 Emissions (tpy)	**15.64**	
PM-10 Emissions (g/s)	**0.45**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	8955	
PM-10 Emissions (tpy)	**43.10**	
PM-10 Emissions (g/s)	**1.24**	

TOTAL

Total PM-10 Emissions (tpy)	**1034.91**
Total PM-10 Emissions (g/s)	**28.53**

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: North Antelope Rochelle Mine
Inventory Year: 2018
Coal Production (MMTPY): 140

Basis: MD-16282
Date: June 15, 2015
Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	54400	
PM-10 Emissions (tpy)	**94.79**	
PM-10 Emissions (g/s)	**2.73**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	227.916	MMbcy
PM-10 Emissions (tpy)	**892.3**	
PM-10 Emissions (g/s)	**25.67**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	148.748	MMbcy
PM-10 Emissions (tpy)	**669.4**	
PM-10 Emissions (g/s)	**19.26**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	140	MMtpy
PM-10 Emissions (tpy)	**44.10**	
PM-10 Emissions (g/s)	**1.27**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	140	MMtpy
PM-10 Emissions (tpy)	**40.16**	
PM-10 Emissions (g/s)	**1.16**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	9475	acres
Treated Disturbed Area	2104	acres
PM-10 Emissions (tpy)	**742.19**	
PM-10 Emissions (g/s)	**21.35**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	227.916	MMbcy
Vehicle Miles Traveled	2182674	VMT
Annual Haul Distance	1.32	miles
PM-10 Emissions (tpy)	**256.65**	
PM-10 Emissions (g/s)	**7.38**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: North Antelope Rochelle Mine
Basis: MD-16282
Inventory Year: 2018
Date: June 15, 2015
Coal Production (MMTPY): 140
Engineer: Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	140	MMtpy
Vehicle Miles Traveled	1735300	VMT
Annual Haul Distance	2.97	miles
PM-10 Emissions (tpy)	**362.75**	
PM-10 Emissions (g/s)	**10.44**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	93000	
PM-10 Emissions (tpy)	**162.05**	
PM-10 Emissions (g/s)	**4.66**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	933	
PM-10 Emissions (tpy)	**3.67**	
PM-10 Emissions (g/s)	**0.11**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	1011	
PM-10 Emissions (tpy)	**5.69**	
PM-10 Emissions (g/s)	**0.16**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	519075	VMT
PM-10 Emissions (tpy)	**33.74**	
PM-10 Emissions (g/s)	**0.97**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	190391	
PM-10 Emissions (tpy)	**52.03**	
PM-10 Emissions (g/s)	**1.50**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	29436	
PM-10 Emissions (tpy)	**141.67**	
PM-10 Emissions (g/s)	**4.08**	

TOTAL

Total PM-10 Emissions (tpy)	**3501.15**
Total PM-10 Emissions (g/s)	**96.64**

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: Antelope | Basis: MD-13361
Inventory Year: 2018 | Date: June 15, 2015
Coal Production (MMTPY): 52 | Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	18974	
PM-10 Emissions (tpy)	**33.06**	
PM-10 Emissions (g/s)	**0.95**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	217.751	MMbcy
PM-10 Emissions (tpy)	**852.5**	
PM-10 Emissions (g/s)	**24.52**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	40.3524	MMbcy
PM-10 Emissions (tpy)	**181.6**	
PM-10 Emissions (g/s)	**5.22**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	52	MMtpy
PM-10 Emissions (tpy)	**16.38**	
PM-10 Emissions (g/s)	**0.47**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	52	MMtpy
PM-10 Emissions (tpy)	**14.92**	
PM-10 Emissions (g/s)	**0.43**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	5500	acres
Treated Disturbed Area	0	acres
PM-10 Emissions (tpy)	**412.50**	
PM-10 Emissions (g/s)	**11.87**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	217.751	MMbcy
Vehicle Miles Traveled	3699832	VMT
Annual Haul Distance	2.34	miles
PM-10 Emissions (tpy)	**435.05**	
PM-10 Emissions (g/s)	**12.52**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: Antelope | Basis: MD-13361

Inventory Year: 2018 | Date: June 15, 2015

Coal Production (MMTPY): 52 | Engineer: Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	52	MMtpy
Vehicle Miles Traveled	2139700	VMT
Annual Haul Distance	9.88	miles
PM-10 Emissions (tpy)	**447.29**	
PM-10 Emissions (g/s)	**12.87**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	89487	
PM-10 Emissions (tpy)	**155.93**	
PM-10 Emissions (g/s)	**4.49**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	572	
PM-10 Emissions (tpy)	**2.25**	
PM-10 Emissions (g/s)	**0.06**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	741	
PM-10 Emissions (tpy)	**4.17**	
PM-10 Emissions (g/s)	**0.12**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	314229	VMT
PM-10 Emissions (tpy)	**20.42**	
PM-10 Emissions (g/s)	**0.59**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	119178	
PM-10 Emissions (tpy)	**32.57**	
PM-10 Emissions (g/s)	**0.94**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	38071	
PM-10 Emissions (tpy)	**183.23**	
PM-10 Emissions (g/s)	**5.27**	

TOTAL

Total PM-10 Emissions (tpy)	**2791.85**
Total PM-10 Emissions (g/s)	**75.04**

Appendix C

PM_{10} Emission Inventory
Model Year 2023

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: Black Thunder
Inventory Year: 2023
Coal Production (MMTPY): 190

Basis: A0000611
Date: June 15, 2015
Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	27768	
PM-10 Emissions (tpy)	**48.38**	
PM-10 Emissions (g/s)	**1.39**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	560.495	MMbcy
PM-10 Emissions (tpy)	**2194.3**	
PM-10 Emissions (g/s)	**63.12**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	269.071	MMbcy
PM-10 Emissions (tpy)	**1210.8**	
PM-10 Emissions (g/s)	**34.83**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	190	MMtpy
PM-10 Emissions (tpy)	**59.85**	
PM-10 Emissions (g/s)	**1.72**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	190	MMtpy
PM-10 Emissions (tpy)	**54.51**	
PM-10 Emissions (g/s)	**1.57**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	12642	acres
Treated Disturbed Area	0	acres
PM-10 Emissions (tpy)	**948.15**	
PM-10 Emissions (g/s)	**27.28**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	560.495	MMbcy
Vehicle Miles Traveled	9683305	VMT
Annual Haul Distance	2.38	miles
PM-10 Emissions (tpy)	**1138.63**	
PM-10 Emissions (g/s)	**32.76**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory
Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: Black Thunder | Basis: A0000611
Inventory Year: 2023 | Date: June 15, 2015
Coal Production (MMTPY): 190 | Engineer: Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	190	MMtpy
Vehicle Miles Traveled	5730401	VMT
Annual Haul Distance	7.24	miles
PM-10 Emissions (tpy)	**1197.90**	
PM-10 Emissions (g/s)	**34.46**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	219917	
PM-10 Emissions (tpy)	**383.20**	
PM-10 Emissions (g/s)	**11.02**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	1357	
PM-10 Emissions (tpy)	**5.34**	
PM-10 Emissions (g/s)	**0.15**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	1580	
PM-10 Emissions (tpy)	**8.89**	
PM-10 Emissions (g/s)	**0.26**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	845834	VMT
PM-10 Emissions (tpy)	**54.98**	
PM-10 Emissions (g/s)	**1.58**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	477422	
PM-10 Emissions (tpy)	**130.47**	
PM-10 Emissions (g/s)	**3.75**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	59500	
PM-10 Emissions (tpy)	**286.36**	
PM-10 Emissions (g/s)	**8.24**	

TOTAL

Total PM-10 Emissions (tpy)	**7721.81**
Total PM-10 Emissions (g/s)	**213.90**

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: School Creek
Inventory Year: 2023
Coal Production (MMTPY): 40

Basis: CT-6445
Date: June 15, 2015
Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	9229	
PM-10 Emissions (tpy)	**16.08**	
PM-10 Emissions (g/s)	**0.46**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	62.1717	MMbcy
PM-10 Emissions (tpy)	**243.4**	
PM-10 Emissions (g/s)	**7.00**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	39.5833	MMbcy
PM-10 Emissions (tpy)	**178.1**	
PM-10 Emissions (g/s)	**5.12**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	40	MMtpy
PM-10 Emissions (tpy)	**12.60**	
PM-10 Emissions (g/s)	**0.36**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	40	MMtpy
PM-10 Emissions (tpy)	**11.48**	
PM-10 Emissions (g/s)	**0.33**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	3807	acres
Treated Disturbed Area	1632	acres
PM-10 Emissions (tpy)	**310.01**	
PM-10 Emissions (g/s)	**8.92**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	62.1717	MMbcy
Vehicle Miles Traveled	451824	VMT
Annual Haul Distance	1.00	miles
PM-10 Emissions (tpy)	**53.13**	
PM-10 Emissions (g/s)	**1.53**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: School Creek | Basis: CT-6445

Inventory Year: 2023 | Date: June 15, 2015

Coal Production (MMTPY): 40 | Engineer: Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	40	MMtpy
Vehicle Miles Traveled	904720	VMT
Annual Haul Distance	5.43	miles
PM-10 Emissions (tpy)	**189.13**	
PM-10 Emissions (g/s)	**5.44**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	30185	
PM-10 Emissions (tpy)	**52.60**	
PM-10 Emissions (g/s)	**1.51**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	267	
PM-10 Emissions (tpy)	**1.05**	
PM-10 Emissions (g/s)	**0.03**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	437	
PM-10 Emissions (tpy)	**2.46**	
PM-10 Emissions (g/s)	**0.07**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	66584	VMT
PM-10 Emissions (tpy)	**4.33**	
PM-10 Emissions (g/s)	**0.12**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	59935	
PM-10 Emissions (tpy)	**16.38**	
PM-10 Emissions (g/s)	**0.47**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	8955	
PM-10 Emissions (tpy)	**43.10**	
PM-10 Emissions (g/s)	**1.24**	

TOTAL	
Total PM-10 Emissions (tpy)	**1133.85**
Total PM-10 Emissions (g/s)	**31.38**

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: North Antelope Rochelle Mine
Inventory Year: 2023
Coal Production (MMTPY): 140

Basis: MD-16282
Date: June 15, 2015
Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	59200	
PM-10 Emissions (tpy)	**103.15**	
PM-10 Emissions (g/s)	**2.97**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	225	MMbcy
PM-10 Emissions (tpy)	**880.9**	
PM-10 Emissions (g/s)	**25.34**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	126.25	MMbcy
PM-10 Emissions (tpy)	**568.1**	
PM-10 Emissions (g/s)	**16.34**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	140	MMtpy
PM-10 Emissions (tpy)	**44.10**	
PM-10 Emissions (g/s)	**1.27**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	140	MMtpy
PM-10 Emissions (tpy)	**40.16**	
PM-10 Emissions (g/s)	**1.16**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	9475	acres
Treated Disturbed Area	2104	acres
PM-10 Emissions (tpy)	**742.19**	
PM-10 Emissions (g/s)	**21.35**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	225	MMbcy
Vehicle Miles Traveled	2724215	VMT
Annual Haul Distance	1.67	miles
PM-10 Emissions (tpy)	**320.33**	
PM-10 Emissions (g/s)	**9.22**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory
Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: North Antelope Rochelle Mine
Basis: MD-16282
Inventory Year: 2023
Date: June 15, 2015
Coal Production (MMTPY): 140
Engineer: Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	140	MMtpy
Vehicle Miles Traveled	1668188	VMT
Annual Haul Distance	2.86	miles
PM-10 Emissions (tpy)	**348.72**	
PM-10 Emissions (g/s)	**10.03**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	101000	
PM-10 Emissions (tpy)	**175.99**	
PM-10 Emissions (g/s)	**5.06**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	933	
PM-10 Emissions (tpy)	**3.67**	
PM-10 Emissions (g/s)	**0.11**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	984	
PM-10 Emissions (tpy)	**5.54**	
PM-10 Emissions (g/s)	**0.16**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	566300	VMT
PM-10 Emissions (tpy)	**36.81**	
PM-10 Emissions (g/s)	**1.06**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	186016	
PM-10 Emissions (tpy)	**50.83**	
PM-10 Emissions (g/s)	**1.46**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	31256	
PM-10 Emissions (tpy)	**150.43**	
PM-10 Emissions (g/s)	**4.33**	

TOTAL

Total PM-10 Emissions (tpy)	**3470.93**
Total PM-10 Emissions (g/s)	**95.52**

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

Mine: Antelope
Inventory Year: 2023
Coal Production (MMTPY): 52

Basis: MD-13361
Date: June 15, 2015
Engineer: Andrew Keyfauver

SCRAPER OPERATIONS

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Scraper Hours/Year	18489	
PM-10 Emissions (tpy)	**32.22**	
PM-10 Emissions (g/s)	**0.93**	

OVERBURDEN REMOVAL

Percent Suspended (%)	75	
Overburden Density	1.74	ton/bcy
Emission Factor - T/S	0.02	lb/ton
Overburden Removed by T/S	209.589	MMbcy
PM-10 Emissions (tpy)	**820.5**	
PM-10 Emissions (g/s)	**23.60**	
Emission Factor - Dragline	0.04	lb/bcy
Overburden removed by Dragline	40.3513	MMbcy
PM-10 Emissions (tpy)	**181.6**	
PM-10 Emissions (g/s)	**5.22**	

COAL REMOVAL

Emission Factor	0.003	lb/ton
Percent Suspended (%)	70	
Coal Removed	52	MMtpy
PM-10 Emissions (tpy)	**16.38**	
PM-10 Emissions (g/s)	**0.47**	

TRUCK DUMP

Emission Factor	0.017	lb/ton
Control Factor (%)	85	
Control Method	Stilling Shed	
Percent Suspended (%)	75	
Coal Production Rate	52	MMtpy
PM-10 Emissions (tpy)	**14.92**	
PM-10 Emissions (g/s)	**0.43**	

WIND EROSION

Emission Factor	0.25	ton/acre/yr
Emission Factor	0.05	ton/acre/yr
Disturbed Area	6200	acres
Treated Disturbed Area	0	acres
PM-10 Emissions (tpy)	**465.00**	
PM-10 Emissions (g/s)	**13.38**	

OVERBURDEN HAUL ROADS

Emission Factor	1.960	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	15	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	
Overburden Density	1.74	ton/bcy

Pit #1

Overburden Hauled	209.589	MMbcy
Vehicle Miles Traveled	3611103	VMT
Annual Haul Distance	2.38	miles
PM-10 Emissions (tpy)	**424.62**	
PM-10 Emissions (g/s)	**12.22**	

Pit #2

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Overburden Hauled	0	MMbcy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division

Coal Mine Emission Inventory

Fugitive PM_{10} Calculation Form

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Mine: Antelope | Basis: MD-13361
Inventory Year: 2023 | Date: June 15, 2015
Coal Production (MMTPY): 52 | Engineer: Andrew Keyfauver

COAL HAUL ROADS

Emission Factor	3.484	lb/VMT
Number of Wet Days	100	
Truck Capacity	240	tons
Truck Speed	20	mph
Road Surface Silt Content	8.6	
Tire Correction Factor	2.5	
Percent Suspended (%)	62	
Control Factor (%)	60	
Control Method	Water/Chemicals	

Pit #1

Coal Hauled	52	MMtpy
Vehicle Miles Traveled	2150775	VMT
Annual Haul Distance	9.93	miles
PM-10 Emissions (tpy)	**449.61**	
PM-10 Emissions (g/s)	**12.93**	

Pit #2

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #3

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #4

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

Pit #5

Coal Hauled	0	MMtpy
Vehicle Miles Traveled	0	VMT
Annual Haul Distance	#DIV/0!	miles
PM-10 Emissions (tpy)	**0.00**	
PM-10 Emissions (g/s)	**0.00**	

HAUL ROAD REPAIR

Emission Factor	32	lb/hr
Number of Wet Days	100	
Control Factor (%)	50	
Control Method	Water	
Grader Hours/Year	87196	
PM-10 Emissions (tpy)	**151.94**	
PM-10 Emissions (g/s)	**4.37**	

COAL BLASTING

Emission Factor	35	lb/blast
Percent Suspended (%)	75	
Number of Coal Blasts	572	
PM-10 Emissions (tpy)	**2.25**	
PM-10 Emissions (g/s)	**0.06**	

OVERBURDEN BLASTING

Emission Factor	50	lb/blast
Percent Suspended (%)	75	
Number of Overburden Blasts	751	
PM-10 Emissions (tpy)	**4.22**	
PM-10 Emissions (g/s)	**0.12**	

WATERTRUCK

Emission Factor	0.26	lb/VMT
Vehicle Miles Traveled	306191	VMT
PM-10 Emissions (tpy)	**19.90**	
PM-10 Emissions (g/s)	**0.57**	

DOZERS ON OB

Emission Factor	2.51	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	111395	
PM-10 Emissions (tpy)	**30.44**	
PM-10 Emissions (g/s)	**0.88**	

DOZERS ON COAL

Emission Factor	44.19	lb/hr
C = ((365-W)/365)	0.726	
Dozer Hours Per Year	39038	
PM-10 Emissions (tpy)	**187.88**	
PM-10 Emissions (g/s)	**5.40**	

TOTAL

Total PM-10 Emissions (tpy)	**2801.50**
Total PM-10 Emissions (g/s)	**75.19**